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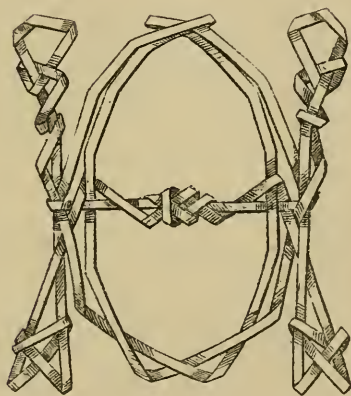
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VOL. IX. PART 1.

DECEMBER, 1876.

PART I.

Original Contributions.

ON THE INFLUENCE OF THE SEXUAL SYSTEM ON
DISEASES OF THE EYE.

A Lecture delivered at Moorfields, April 20, 1876.

By JONATHAN HUTCHINSON.

THE previous lectures of this course* have been devoted chiefly to the attempt to examine, by the light of fresh clinical facts, certain questions as regards the more rare forms of eye-disease. Some of those which we have discussed have as yet received but little attention from authors, or have perhaps been deemed too obscure and too doubtful for serious debate. We have examined in detail the facts as regards tobacco amblyopia, and the other forms of amaurosis akin to it, and one lecture was devoted to the rare and very curious cases in which women who have never smoked become the subjects of a kind of blindness which is in its early stages just like that so common in smokers. In other lectures we speculated as to

* This was the last lecture but one of a course of fifteen lectures.

the theory of reflex or sympathetic ophthalmitis; as to the possible influence of disease of the liver in producing amaurosis; and we have also inquired as to the evidence which connects affections of the fifth nerve causing neuralgia or toothache, with failures in function, or disturbances in nutrition, of the eyeball. Not a few of our topics have been, as I had to remark at the time, somewhat old-fashioned, such as were subjects of constant debate or of firm belief amongst our forefathers, but which we of the ophthalmoscope era have been inclined to let sleep. Our predecessors were obliged to guess much where we can see clearly, and the natural consequence was, that they were compelled to have frequent recourse to the nervous system to explain facts of which they only saw a small part. We, on the other hand, finding that much which they thought "functional" or "sympathetic" is really due to visible local changes, have been prone hastily to sweep aside what we have regarded as the mere cobweb hypotheses of ignorance. I have had to plead repeatedly that it behoves us to be very careful in this matter, lest we overlook realities. The nervous system, with all its mysteries, remains what it was; and reflex disturbances are just as possible as ever they were. Nor is it alone with reflex disturbances that we have to do, for the labours of pathologists in this special department, Dr. Lockhart Clarke, Dr. Hughlings Jackson, Prof. Charcot, and many others, are every year making it more clear that there exist numerous special forms of degeneration or of faint forms of inflammatory change in the nervous system which spread in definite directions, produce definite groups of symptoms, and which yet are inappreciable at the postmortem, excepting by the aid of the microscope. We have found, too, with greater accuracy than ever before, how disease of one part of the nervous system may produce symptoms which make another suspected. I now have to undertake a branch of the subject which is undoubtedly in many of its aspects sufficiently repulsive, but which it is not the less our duty as medical men to study carefully. I refer to the possible influence of the sexual system, and of various abuses and disorders of the sexual

function, upon the eyes and sight. Of course, I do not refer to the diseases which are called "venereal," but which are only by accident as it were associated with the genital organs; I mean only such maladies as are induced by the re-action of one part of the system upon another quite independently of the introduction from without of any poison or the setting up of local inflammation. Now, there can be no doubt that every organ exercises an influence upon others, and that disorder of one function may often in several different ways induce disturbance of general health, or even special disease of distant parts. If the liver be disordered, the blood will suffer, and the nervous system will suffer, and a complicated train of various secondary diseases will ensue: the same is true of the kidneys, of the spleen, and in degree of all the more important viscera. It is, however, I think, true of the organs which, in either sex, make up what we term the reproductive system, that they exert a deeper and a more mysterious influence than do any other parts of the organism, not only over the physical health but over the moral character of the individual. It is to the possible limits and extent of this influence and in especial reference to the organ of sight that we have now to inquire. In former lectures I have been obliged, incidentally, to mention this subject often, for in inquiring as to the possible causes of amaurosis in various cases, we have had to ask carefully whether or not it was probable that sexual influences might have been at work; we had to ask this question especially in reference to the tobacco cases, in which, since they occur almost solely in young or middle-aged adult men, suspicions of this kind force themselves upon us. Thus, I have already mentioned several of the cases which I purpose to recapitulate and place in better order to-night. The subject is very large and very difficult, and much of what I shall have to say can rank as not much more than conjecture.

It may be convenient, perhaps, to mention first, seriatim, certain suspicions which have been current in the profession as to the possibilities alluded to, and subsequently examine each in order.

I. First, then, I will say that there is a wide-spread suspicion, that in both sexes, but especially in males, sexual irregularities inducing debility, are common causes of the symptom known as *muscæ*.

II. It is believed by many that premature and exhausting use of the sexual function may induce positive amaurosis, with more or less complete blindness. How it is done, and by what changes in the eyeball or brain, there has been as yet but little evidence to show.

III. It is strongly suspected that sometimes in adult men great venereal excess may result in failure of sight, sometimes with and sometimes without other evidences of spinal or cerebral disease.

IV. The association of impotence with blindness from one or other of the more obscure forms of "amaurosis," is so frequent, that it is thought that there must be some link of causal connection between the two.

V. A few scattered cases seem to point to the conclusion that excessive masturbation may induce not only dulness of sight and *muscæ*, but may cause the vitreous to soften and become opaque, with possibly slow inflammatory changes in other structures.

VI. It is credited to masturbation, that not only does it cause *muscæ*, but that it may induce curious subjective symptoms, which the patients describe by saying that the eye feels "glassy and stiff," and that sight, although it cannot be proved to be imperfect, is dull.

It will be seen from this enumeration that our subject seems to divide itself naturally into two divisions; first, the disorders which are merely functional and temporary, and due to want of tone; and, secondly, those which are structural and permanent. Respecting the reality and the frequency of the former, there will probably be but little dispute, but the admission of the latter may demand more faith. Every

one is aware that what is known as the tone of the nervous system may be very easily and very certainly lowered by sexual indulgence. "*Omne animale post coitum triste*," is an observation as old as the first records of natural history, and, that the "sadness" may, by excess, be intensified to almost any extent, there is no difficulty in believing. Is it possible, however, that, further than this, the loss of tone, if greatly prolonged, or frequently recurring, may induce at last structural changes, or may initiate inflammation? It is well that, for practical purposes, we should keep a clear distinction between the two things. By loss of tone, we mean such changes in the molecular constitution of the nerve centres as may be wholly repaired by food, recreation, and rest. If the changes have gone further than this, and if we believe them to be insusceptible of complete recovery, we should then use other words, and speak of structural alteration, degeneration, or inflammation, as the case might be. Whilst, however, separating them clearly for clinical purposes, it is important to admit that severe losses of tone, frequently repeated, may eventually result in degeneration. I may illustrate this by reference to the failure of memory, so constantly and so bitterly complained of by those who suffer from spermatorrhœa. So long as this failure is only temporary and in direct relation with the recent occurrence of its cause, we may attribute it to loss of tone (this defective tone being possibly induced by diminished blood supply); but when it becomes permanent, it is probably indicative of degeneration or atrophy of the molecular matter of the brain corpuscles. Now, it is not improbable that this is pretty much what takes place in the production of muscæ by masturbation. The eyeball has probably on many occasions been reduced to the dull, "glassy," heavy condition indicative of diminished tone, before the minute changes in the vitreous occur which cause the muscæ. The latter are, I should suspect, to be regarded as degenerative rather than inflammatory. You will see that I am for the time taking for granted that muscæ may be caused through the sexual system, and about this I think

there can be but little doubt. The evidence respecting them seems to be much of the same character as it is in the case of acne. It is undoubted that both acne and muscæ may be produced by other than sexual causes, and very often are so. But it is equally undoubted that both are commonly met with under conditions which suggest in the strongest manner that these causes have been at work. Neither of them are common in children or in old people, and for both the ordinary period of first occurrence is that when the sexual function is in early and possibly in premature activity. In many cases the association between the two seems most close. Thus a young man suffering severely from frequent emissions will come complaining of muscæ, and may mention specially and voluntarily that they are always more troublesome when his tone is reduced by the discharges. Confessed onanists, and those suffering from spermatorrhœa, almost always amongst their symptoms mention muscæ, and they are, I think, very disproportionately frequent in the male sex. Muscæ differ from acne as symptoms of sexual derangement in this, that whilst acne spots imply only sexual disturbance, and by no means always indicate debility, muscæ seldom occur until the system has suffered considerably from sexual exhaustion. The facts as regards acne are most important, as illustrating the manner in which it is possible for the reproductive function to cause changes in the nutrition of distant parts. It is necessary, of course, that a person should be pre-disposed both by the structure of his skin and by the state of his nervous system. Under such circumstances, according to the testimony of many patients, a single act of intercourse or a nocturnal emission may produce acne spots within twenty-four hours. In other cases, styes or small boils may be induced under the same circumstances, and with like definiteness. Unless I had been told this by several persons and by close and accurate observers of their health, I should not have believed it, or ventured to repeat it to you. In women, however, we have facts yet more positive, because more frequently recurring. A lady, apparently in perfect health,

may reveal every menstrual period by the appearance of two or three acne spots on her face, at other times perfectly clear, whilst in those who suffer from acne habitually, the influence of each menstruation, in temporarily increasing it, is usually most marked. Thus these various facts seem to support each other, and to compel us to the belief that the nutrition of the follicles of the face and shoulders, as well as that of the vitreous body of the eye, may be impaired very certainly and very speedily by reduction of tone through the sexual system. The fact that both symptoms may be induced by disorder of the liver and stomach, and frequently occur without there being anything amiss as regards sexual matters, so far from invalidating our conclusions, supports them, since the influence brought to bear under these different conditions is probably to some extent the same in kind.

Examples of another class of subjective symptoms, which I have mentioned as sometimes attending or preceding *muscæ*, are not very common in Hospital practice. In private, however, it is by no means infrequent to have to listen to complaints that the eyes feel "as if made of glass," that they "feel stiff," that "the eyelids feel stiff," that the eyes "feel as if they were staring and would start out of the head." Sometimes with these complaints there is some slight congestion of the conjunctiva, or a slight chronic ophthalmia tarsi. The expressions referred to almost always, I believe, imply sexual debility, and usually follow either spermatorrhœa or masturbation, or both; they are frequently attended by extreme depression of spirits and great nervousness. A gentleman of near 40, who consulted me many years ago, complained of exactly the group of symptoms I have mentioned. In addition he stated that he could not read for more than a few minutes without causing eye-ache; formerly he had been a great reader. His history was, masturbation in early life, early sexual debility, a long period of continuous and tolerable health, then liability to emissions, for which he was long treated by an eminent and able specialist, with a temporary

cure; next, under special circumstances of excitement, a violent relapse, frequent emissions, followed by an absolute cessation of all sexual desire, extreme nervous depression, and the eye-symptoms mentioned. Shortly afterwards this gentleman committed suicide in a most determined manner. It should be stated that there was a history of insanity in his family, and that no doubt his nervous-system-organisation was peculiar. I have no doubt, however, that his sexual functions had been the exciting cause of all his sufferings, and had indeed proved the curse of his life. He was, as the subjects of many of these cases are, a man of fine feeling, and one who had fought very hard to maintain sexual purity. On the very day before his suicide he called on me for, I believe, no other object than to try to convince me that he had, as he expressed it, "by no means been a beast," but had really done his utmost to overcome his infirmities.*

Whilst, however, I believe that the cases are common in which the influence of sexual irregularities is sufficient to be very decided, to mark the patient's career in life, and to produce, amongst other results, slight derangements both in function and nutrition of the eye and its appendages, I see no reason to doubt that examples of serious ill results are rare. I have seen but very few cases in which the vitreous became softened and filled with opacities in connexion with such causes; yet these are, I suppose, to be regarded only as extreme developments of the changes of which *muscæ* denote the beginning. One such has impressed itself on my memory, and I have, I believe, seen a few others of the same class, but

* In reflecting over such cases as this, unfortunately, I suspect, not so very infrequent, one cannot help remembering the fearfully graphic lines of a modern panegyrist of lust:—

"Thou shalt blind his bright eyes though he wrestle,
 Thou shalt chain his light limbs though he strive;
 In his lips all thy serpents shall nestle,
 In his hands all thy cruelties thrive.
 In the day time thy voice shall go through him,
 In his dreams he shall feel thee and ache;
 Thou shalt kindle by night and subdue him
 Asleep and awake."

less well characterised. A man, of about 36, was brought by his brother from the country, being nearly blind. He was nervous, and in a most desponding condition. The eyeballs were somewhat softened, and in each vitreous were crowds of opacities. He assured me that he had never been in risk of syphilis, and that all his ailments had been brought on by an unconquered habit of self-abuse. I learnt that he afterwards became quite blind, and died in a lunatic asylum.

I find in a foot-note to Mr. Travers' chapter on Diseases of the Retina, the following: "The most pitiable is the amaurosis of early life, from excess of sexual indulgence, and especially from solitary vice. The following are strong examples:—A country lad, of robust constitution, became the alternately favoured paramour of two females, his fellow servants, under the same roof; he was the subject of gutta serena in less than a twelvemonth. Another, at an early period of puberty, suddenly fell into despondency and shunned society, he never left his chamber but when the shade of night concealed him from observation, and then selected an unfrequented path; it was not discovered until too late that, in addition to other signs of nervous exhaustion, a palsy of the retina was the consequence of habitual masturbation." A case, not very dissimilar to the first of the two just quoted, occurred to myself some years ago. A vigorous Scotchman, now the father of a large family, the eldest of which has suffered severely from inherited syphilis, told me that in boyhood he had himself been almost blind; he used, as he said, "to see crowds of blacks before his eyes." His parents brought him up to London for advice, and I am not sure that he did not see Travers. At any rate whilst in town he began to improve, and subsequently he almost wholly recovered. He assured me that the sole cause of his alarming failure of sight was that he had been allowed to sleep in the same room with a servant girl, who used to persuade him, although a mere boy, to try to have connexion with her. The case is of importance as showing that complete recovery may ensue from a very dangerous condition if the cause be removed. Unfortunately

in the more common cases of masturbation such entire removal of the cause is but rarely attained, and the recoveries are usually not so complete. This case, and the two given by Travers, confirm the general belief that it is during the early periods of life that sexual excesses are especially fraught with risk. The breeders of cattle are, I believe, well aware of this, and are usually very careful as to the premature or excessive use of young males.

As regards the precise character of the changes induced in the eye in these cases, we may speculate with much probability, that in the last there were films in the vitreous, but it is not possible to form any opinion in the two given by Travers. I do not know that I have ever seen neuritis of a definite character in undoubted relation with sexual excesses, but I have seen a few which were very suspicious. A gentleman married only a few weeks came to me for advice, in extreme distress—"I am almost blind." He could at six feet only just see letters of 200, yet he was not seriously ill, and excepting some headache, had no other symptoms. There was no history of any unusual excess. I advised abstention, and gave tonics with small doses of mercury, and in a few months he completely recovered. I believe that he has subsequently suffered from other symptoms of nervous exhaustion, which appear to be fairly referable to the cause which I suspected in the case of his eyes; on the whole, however, he has enjoyed fair health, and has experienced no relapse of his amaurosis. In his case, the discs were slightly hazy, but it was so little, that one good observer doubted whether it was more than a personal peculiarity. Cases such as this remind us of what we proved to be the fact in tobacco amaurosis, that a man may experience rather rapid and very considerable failure of sight, may recover perfectly on disuse of the tobacco, and may, afterwards, without showing any tendency to relapse, resume the habit of smoking in moderation. It is quite possible that the influence of the two kinds of depressants may be to a considerable extent similar. In the case of a boatman who came to this Hospital from Yorkshire, blind, with white discs,

the amaurosis had come on immediately after his marriage, and without any other assignable cause. It seemed probable that he had had a form of neuritis, but he showed no indications of cerebral tumour, and remained in good health.

I have but little to say as to eye disease *in women* resulting from the influence of the sexual system. Sexual irregularities are in the first place much less frequent, in the next, far less potent, in women than in men. In the almost complete immunity of the female sex from some of the forms of amaurosis which I refer to in this lecture, I find another reason for suspecting the influence of the sexual system. Not only are several varieties of amaurosis almost peculiar to males, but other forms of nerve disorder, loco-motor ataxia, for instance, observe the like rule. Now, men differ from women as regards their exposure to causes of nerve disorder in several other matters quite apart from the difference in the sexual system. They smoke, they drink more, they more frequently contract syphilis, and they are in some ways more exposed to mental wear and harass. If, however, in any given case all these possible causes have been eliminated, and in some of the more peculiar forms of eye disease in males, they may all be eliminated, we then fall back on the sexual system.

It is comparatively seldom that young women come to us complaining of muscæ, and when they do, there is usually some definite cause in the condition of the eye. I do not think that at this Hospital, amongst those who complain of muscæ, we have one young woman for five young men. In later life, at almost the climacteric period, cases in women are I think more common.* Nor can I recollect many cases in which, with more severe symptoms of eye disorder in women, I have felt inclined to suspect the sexual functions. It is true that it is far more difficult to inquire about masturbation in girls than in men, but with all allowance for this, I repeat it

* I make these statements without having counted cases, and from general impressions only.

is but rarely that I see any reason to suspect it. In one remarkable case, which I well remember, since the poor patient gave me a great deal of trouble for many years, I felt certain that excessive masturbation was the cause of a state bordering on insanity, and attended by slowly progressive and unsymmetrical amaurosis. The patient was a single woman, aged 40, with an earthy pallor of skin, and nervous to a most miserable degree. One eye became blind, with pallor of the outer side of the disc, and the other failed greatly. I have lost sight of the poor creature, and suspect that she has become an inmate of some asylum.

That there are certain forms of amblyopia and disordered nutrition of the eye, which are in connexion with disturbed or suspended menstruation, is highly probable; in fact, when in the female sex the generative function does affect the sight, it is I think more frequently in connexion with menstruation than with any form of excess or irregularity in sexual indulgence.

We know also, that paraplegia from sexual causes (if we except the "functional" forms met with in hysterical girls) is rare in females, whilst examples of it in men are not uncommon. The cases of paraplegia in men in this connexion are worthy of very careful study in association with the disorders of sight. It is probable that close examination would show us that we must recognise several distinct forms, some chronic and some acute, some easily recovered from, and others permanent. It would be of much interest to know whether any are unsymmetrical.

When satyriasis occurs, as it sometimes does, in connexion with symptoms of spinal disease and with failure of sight, it is sometimes very difficult to determine whether it is the cause or only a symptom. I have seen very marked examples of it in connexion with certain forms of amaurosis attended by white atrophy. It has also been noticed in loco-motor ataxia. It is, I believe, not infrequently a prelude to entire extinction of the sexual function. It may not improbably in most cases be allowed to stand as an indication that the man's sexual system

has for long been unduly prominent, and a source of danger to his health.

There yet remain for mention certain cases in which the sight fails at or about puberty, or perhaps a few years later, without apparent cause, and under circumstances which, whilst nothing can be proven, much may be suspected. These cases are not frequent, and they occur almost solely in males. Sometimes two boys in the same family are attacked. There is no visible neuritis, but the discs become pale, the early symptoms being exceedingly like those of tobacco amaurosis. I have had two or three groups of cases of this kind under observation. In one of them, two brothers, who did not smoke, both became nearly blind, with pale discs, soon after the period of puberty.

I must also draw attention to the very frequent coincidence in adult life, and often in very robust men, of amaurosis, slowly progressive, with atrophy, in conjunction with certain failure of the sexual functions. I have seen enough cases illustrating this combination to make me feel sure that there must be some bond of connection. In these cases the eyes do not, as a rule, fail simultaneously, a fact which would suggest the existence of progressive spinal disease. I attach great importance to this simultaneous or non-simultaneous failure. All the true tobacco cases are symmetrical, whilst in most of those in which I have attributed amaurosis to the sexual system, one eye has taken precedence of the other.

In speaking of tobacco, I must mention a possible source of fallacy, and it is this, that in some cases the sexual symptoms are not in any other relation to those displayed by the eyes than as common results of the same cause. I suspect that tobacco not unfrequently induces forms of sexual debility which are very closely parallel in their clinical history to what we now know to be true of tobacco amaurosis. Sometimes the function is reduced by excessive smoking to the very lowest point, or even extinguished, to recover again when the tobacco is left off or reduced in quantity. This

may happen to most robust men. In others, if the patient is unaware of the cause of his condition, and continues to smoke heavily, the function may be permanently suspended. You may have tobacco amaurosis without anaphrodisia, or anaphrodisia without amaurosis, but sometimes, and not infrequently, the two go together. It is in these latter, I repeat, that mistakes may be made, and the sexual system may be blamed as a cause when it is really only a victim.

Here let me remark that in many, perhaps most, of the cases in which paraplegia results from sexual causes there is no affection of the sight. Absolute impotence may also occur without any degree of paraplegia, and without any degree of amaurosis. There is certainly no essential and unvarying bond of connection between these three symptoms. Rather we must admit that these and other symptoms having reference to the sexual system, may present the most various combinations, now one, now another, and now several together being omitted from the usual group.

Let me say also that, in attempting to estimate the influence of the sexual functions upon the health, we must by no means confine our inquiries to excessive indulgence either in intercourse or masturbation. In many persons, excessive irritability, frequent and continued erythsm, without indulgence of any kind, and without emissions, yet tells most seriously on the health, and may, I suspect, produce symptoms very similar to those attending excesses. In such cases, the surgeon must judge for himself, for his patient will often give him very imperfect information.

Thus, then, gentlemen, to conclude, I think we may safely assume that it is probable that the eye does suffer, both in connection with its functions and its structure, from influences brought to bear on it through the sexual system. Whilst in the larger class of cases a functional disturbance—a loss of tone, in which the eye participates with the rest of the organism—is all that results, or, at any rate, at first; yet we must, I think, believe that it is possible for very grave nutritional

changes also to be thus caused. The precise manner in which they are brought about is a question of extreme interest for the physiologist, and, at the same time, one of extreme difficulty.

From a practical point of view, I cannot but think that a knowledge of the facts which we have been discussing is of great importance, not only to our speciality, but to all who undertake the responsible duty of giving advice as to health. Sir James Paget has, as most here probably know, written an eloquent and able lecture on this subject, with the chief aim of counteracting some of the exaggerated impressions which are abroad. It is undoubted that quacks have, for their own purposes, spared no pains to terrify their victims; still, although I much honour Sir James' motive, I must acknowledge that I cannot but suspect that it has led him to estimate too lightly the physical evils which do actually result from sexual irregularities. That bad cases are rare, we must all admit, and it is matter of special congratulation to myself, that in compiling this lecture, and in reviewing for that purpose an experience of many years, during which I have paid constant attention to this subject, I have been able to collect but very few examples of destructive eye-disease from sexual causes. They are, indeed, so exceptional, that a sceptic might almost fairly doubt as to the reality of the supposed bond of connection. I may confess, however, that I cannot myself doubt; I believe that they are perfectly real, that they are examples of the extreme of what is possible, and of what in minor degrees is far from rare.

HISTORICAL NOTICE CONCERNING THE DOCTRINE OF THE SMALLEST VISUAL ANGLE.

By J. HIRSCHBERG, *of Berlin*.*

THE acuteness of vision is measured by the smallest visual angle, under which two luminous points or lines can be distinguished apart. The first researches on this subject were those of Robert Hooke in the year 1674. His statements are accepted by Helmholtz,† but are called in doubt and severely criticised by Aubert‡ and Mauthner.§ Where, as in this instance, a philosopher of the first rank is concerned, one who contended with Newton for the palm, we naturally look for assent rather than adverse criticism, and, at all events, feel impelled to seek for light by strict historical inquiry.

Helmholtz (l. c.) says:—"The acuteness of vision has been much studied since telescopes came to be constructed. Hooke started at once from the right principle by inquiring under which angle it was possible for double stars to be distinguished as such." Aubert (l. c.) has the following:—"As regards the statements concerning the distinguishableness of stars, I must demur to that most equivocal, but ever repeated one of Hooke's (Smith-Kaestner, *Lehrbegriff der Optik*, 1755, pp. 29 and 502), that any one should be able to distinguish stars apart, which are 60" distant from each other. Those are only exceptional cases, in which the satellites of Jupiter can be distinguished by the naked eye: a shoemaker at Breslau, of the name of Schoen, recognised them whilst the

* Translated by Dr. A. Samelson, of Manchester.

† *Physiol. Optik*, p. 223 (*Karsten's Encyclopädie der Physik*, IX. 1867).

‡ *Physiol. Optik*, p. 579 (*Graefe-Saemisch, Augenheilkunde*, II. 2; 1876).

§ *Optische Fehler des Auges*, p. 123, 1876 (first published some years before).

first was two minutes and the third more than four minutes distant from the planet (Humboldt, Kosmos, III, p. 112). The stars ϵ and ς Lyrae, which are $3' 27''$ apart, can only just be distinguished from each other." And Mauthner writes (l. c.):—"Almost in every place where this subject is discussed, we meet with a leading reference to the primary observation of Hooke's (1705), who states that even the most powerful eye is scarcely able to distinguish two stars under a visual angle of less than half a minute, and that scarcely one in a hundred can do so under an angle of less than one minute. If this be intended to mean that, generally speaking, man's eye possesses the power of distinguishing two stars apart under a visual angle of one minute, there never was a more incorrect, and one might say, more untruthful assertion." Again (p. 126): "The fact is that an eye possessed of normal acuteness, according to Snellen, that is one able to differentiate under an angle of one minute, can under the most favourable conditions only distinguish stars which are at least five minutes apart. It is, therefore, not a little strange to find Helmholtz agreeing with the baseless statements of Hooke, and saying: 'The other observers who did not experiment on stars, but on white illuminated stripes or squares, found the acuteness to be somewhat less.' This admission by Helmholtz of the correctness of Hooke's statements is the more to be regretted, as it is not laws alone and rights but references also, that, like hereditary taints, are transmitted perennially; we thus find, *e. g.*, Boettcher, even in 1870, giving the reasons why we see stars under a *lesser* visual angle than we see terrestrial objects, whereas, as a matter of fact, for stars to be distinguished, the visual angle requires to be five times larger, and an eye, distinguishing terrestrial objects under no smaller angle—it would see Snellen's No. 100 at no greater distance than 20 feet—would be amblyopic in a high degree." And, lastly, p. 127:—" . . . all the cited experiments made previously to the latest by Volkmann (1868), proved that the distinguishing power of the human eye does, indeed, under favourable circumstances, attain to

such a height as Hooke had erroneously assumed it to reach under the unfavourable conditions of star-examination, that is to distinguish still clearly under a visual angle of one minute."

The apparent assurance of this author might easily impose upon the reader as the outcome of an accurate verification of references.

I shall, however, in the first instance, show that Hooke, as early as 1674, by his experiments, which were alike correct and exhaustive, has so completely settled the main question concerning the acuteness of vision, that but little more remained to be done.

In Birch's History of the Royal Society (London, 1757, III. p. 120),* we meet with the following:—"January 15th, 1674. Mr. Hooke made an experiment with a ruler divided into such parts as being placed at a certain distance from the eye, appeared to subtend a minute of degree; and being earnestly and curiously viewed by all the persons present, it appeared, that not any one present, being placed at the assigned distance, was able to distinguish those parts, which appeared of the bigness of a minute, but that they appeared confused. This experiment he produced, in order to shew that we cannot by the naked eye make any astronomical or other observation to a greater exactness than that of a minute, by reason, that whatever object appears under a less angle, is not distinguishable by the naked eye; and therefore he alledged, that whatever curiosity was used to make the divisions of an instrument more sure, was of no use, unless the eye were assisted by other helps from optik glasses."

But what are we to say of the statement ascribed to Hooke, that two stars may be distinguished apart under an angle of one minute? The origin of this imputation may, from a reference, unfortunately without the passage referred to, in Smith's "Opticks," Cambr., 1738, p. 31, be traced to

* These experiments are not to be found in the Philos. Transactions. Of course not—"neutiquam acta philosoph-societati regiae tribuenda."—Phil. Transact. 1674, p. 141.

“Animadversions on the first part of the machina coelestis of Johannes Hevelius . . . by Robert Hooke, London, 1674,” pp. 7 and 8 (a work referred to in the Philos. Transactions, 1674, p. 275). This work, in the original, not being procurable in Berlin, my friend Dr. J. Friedländer wrote to the Secretary of the Royal Society, to whose courtesy I am indebted for the following authentic transcript:—

“’Tis impossible with sights made after Ticho’s or Hevelius his way, to distinguish any distance in the Heavens less then half a minute, or thirty seconds, and hardly one of a hundred can distinguish a minute.

“And this being proved, what will become of all the machinations and contrivances for greater instruments, to show the Divisions of single or double Seconds? May not single minutes, nay half minutes, by the help of Diagonal Divisions, be sufficiently distinguished in an instrument of three-foot radius? What need is there then of all the other cumber? Certainly any one that will but try with the one and the other instrument, will find himself able to do as much with an instrument of three foot, as with one of three score, since the eye cannot distinguish a less angle, at least none that I have yet met with hitherto. Who is there that by his bare eye can distinguish any of the Telescopical spots in the moon, though some of them are above a minute in diameter? As for instance, who can see Mount Sinai, so call’d by Hevelius, which is a bright spot in a dark field, and consequently must appear near two minutes in diameter to the naked eye? or who can see Palus Mareotis or the Lacus Niger, which are two dark spots in light fields, and each more then a minute in Diameter? Now if the eye cannot distinguish a smaller object then appears within the angle of half a minute, ’tis not possible to make any observation more accurate, be the instrument never so large.”

Manifestly Hooke’s criticism is concerned with observations by the naked eye, to which, as a cautious philosopher, he assigned rather narrow limits. Yet, moreover, he has himself left us an authoritative interpretation of the above passages.

In the controversy between him and Hevelius, in which at that wonderful period of regeneration of exact research the whole of the learned world took the most lively interest, some of the members of the Royal Society took sides with Hevelius, and thus gave to Hooke the opportunity of replying to their strictures. We find his reply at page xviii of his "Posthumous Works, 1705," where he expressly refers to page 7 of his "Animadversions" which had been written several years before:—

"I believ'd it impossible for any one to distinguish with various sights any distance in the heavens to less than half an minute, and very few to a Minute.

"Our Eyes cannot distinguish an Angle less than half a Minute, nor is this a defect in my own Eyes only, for the Experiment may easily be try'd with the best Eyes."

There is here no reference whatever to stars as distinguishable under an angle of one minute, and it is only in a passage in the Posthumous Works that the stars, although quite incidentally, are adverted to, (Lectures on Light, p. 97, January or February, 1681, published 1705):—"What soever object therefore affect the Eye under a less angle than that Eye can distinguish becomes invisible or not seen. Now whereas most Eyes distinguish not a less angle than a Minute, or the 60th part of a Degree, or 21,600th part of a Circle, therefore whatever is sensated or seen by it is seen of that bigness or under that Angle: and so *if there are 2 or 3, or 10 or 100 small stars so near together, as that they are all comprised within the Angle of one Minute, the Eye has a Sensation of them all, as if they were one Star, and distinguishes nor one from an other*; so likewise is it, that if the Light be strong and powerful, so as to affect the Eye, it allways appears of the Bigness of a Minute, though possibly its real angle be not a second."

It is evident, therefore, that Hooke did not contend that two stars could be made out singly under an angle of one minute; on the contrary, he maintains that two, or any

aggregate of stars contained in the space of one minute, cannot be distinguished apart.

The first who from the standpoint of physiological optics refers to Hooke is Smith (*Opticks*, l. c.) :—

“Dr. Hooke assures us that the sharpest eye cannot well distinguish any distance in the heavens, suppose a spot of the moon’s body, or the distance of two stars, which subtends a less angle at the eye than half a minute ; and that hardly one of a hundred can distinguish it when it subtends a minute (*Animadversions*, p. 8). If the angle be not bigger than this, the two stars appear to the naked eye, as if they were but one.”

This may still be allowed to pass, as may likewise the following negative wording of the reference by Jurin (*Essay upon Distinct and Indistinct Vision*, appendix to Smith’s *Opticks*, p. 152) :—“Dr. Hooke asserts that the sharpest eye cannot distinguish the interval between two stars, that are less than half a minute asunder, and that not one eye in a hundred can distinguish an interval of less than a minute.”

And it is from this negative that there seems to have been evolved, by a process noways warranted in logic, the positive reversal, whereas the correct account is still to be found in Gehler’s *Handwörterbuch der Physik*, iv, 1436, 1824, Muncke.

By the representations of Aubert and Mauthner, from which we started, we are thus reminded of the saying of Laplace, that any testimony is apt, by progressive tradition, to be stript of its truth, not unlike an object which, though still seen distinctly through one plate of glass, is by a great number of such plates rendered quite invisible.

BILATERAL DEVIATIONS OF THE EYES.

By PRIESTLEY SMITH,

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IN Part II of Volume VIII of these Reports, I recorded a case in which both eyes deviated fixedly to one side, while the movements of convergence remained, nevertheless, unaffected.

The case was recorded as "an illustration of the fact that there exist in the brain, centres which preside over the parallel atteral movements of the eyes, which centres are distinct from those which govern the movements of convergence."

The condition of the eyes, as stated in the former paper, appeared to be identical with that described by Dr. Hughlings Jackson, at page 96 of the same volume, as one of the in what he calls the "second degree of hemiplegia," but the hemiplegia was absent.

I am now able to make an important addition to the record of this case, and to place side by side with it some notes of a few other cases belonging to the same category; cases, namely, of ocular deviation due to disease, not of the nerve-trunks, but of the brain-centres which control the movements of the eyes. Only two of these cases occurred in my own practice, the others were observed in the medical wards of the General and the Queen's Hospitals, and I am much indebted to the physicians under whose care they came for calling my attention to them. From a physician's point of view, the notes which I am able to submit are, I fear, defective in many particulars; they contain, however, unless I am mistaken, points of considerable interest.

CASE I.—*Parallel Conjugate Movements Lost—Convergent Movements Retained—Unequal Recovery of Movement in the Two Eyes—Onset of Hemiplegia later.*

The first part of this case is recorded at page 185 of

Volume VIII of these Reports; the salient points are here recapitulated, as follows:—

Pain in the head and vomiting.

Deviation of both eyes to the right.

Total loss of conjugate movement to the left.

Perfect performance of movements of convergence.

Frequent winking of right eyelids.

Synchronous but imperfect winking of left eyelids.

Gradual recovery in right eye of movement to the left.

No paralysis discovered in any other part.

The suggestion offered in the last paragraph of the former paper, that the conjugate deviation might be due to tonic spasm rather than to paralysis, appears to me now to have been erroneous. Shortly after recording the case up to this point, I lost sight of the patient and did not again examine him until the present month, October, 1876. The following history of the events which occurred in the interval was obtained from the patient and from his mother; they are both intelligent and took pains to give me the facts correctly.

Soon after Christmas last the patient noticed a little weakness in the left arm and leg; he could not grasp things well with the hand, and the leg dragged a little. During a month this weakness slowly increased until he was unable to walk. He took to bed, and a few days later he was completely paralysed on the left side; "he could not move a finger or a toe," the left arm and leg were "cold and numb." There was severe headache and vomiting for about a week. About a fortnight later the right side became affected also, but in a minor degree. The leg was almost powerless, the arm and hand were weak and clumsy, but did not lose all power. The face was a little drawn, but they cannot remember to which side. There was not at any time loss of consciousness or confusion of speech. A few weeks later the right side began to recover, the arm first and later the leg. Later still the use began to return in the left side; it returned in the arm before the leg, and first of all in the fingers and toes. The patient speaks with confidence as to the order of the recovery as here stated, and his mother corroborates his account.

During this time there was no fresh trouble with the eyes. The patient believes that they have continued steadily to recover their power of movement since they were last examined by me.

The double vision (resulting from the right eye regaining power of movement before the left) had already disappeared before the paralysis laid him up, and has not been noticed since.

Present state (October 18th, 1876).—The right arm and leg have recovered completely, or very nearly so. The left hand and arm are weak and clumsy; the left leg is very weak and cannot yet be used in walking, the patient can get about a little by supporting himself upon the chairs and table.

There is no discoverable facial paralysis; if any difference exists between the two sides, the left is slightly weaker than the right. The eyes are parallel and properly directed. The right has recovered normal power of movement in all directions. The left, on attempting to turn to the full extent to the left, does so in an unsteady, jerking manner; in all other directions it moves steadily to the normal extent.

CASE II. — *Parallel Conjugate Deviation — Slight Hemiplegia — Unequal Recovery of the Eyes.*

John F., about 45 years of age, was under the care of Dr. Rickards in the General Hospital some months ago. Before his admission he had had severe pain in the head and vomiting for about eight weeks. On admission, both eyes were turned fixedly to the right, and neither had any power of movement towards the left; the left side of the face was paralysed, the left eyelids could not be closed; there was slight paralysis of the left limbs. When I examined the patient's eyes with Dr. Rickards, six weeks later, there was conjugate deviation to the right, both eyes were well turned to that side and they were parallel, but when the patient made an effort to look towards the left it was found that the right eye had recovered power of movement in this direction up to, and a little beyond, the median line, whereas the left eye had almost no power of movement to the left. The right eyelids winked frequently and their movement was accompanied by a very feeble and incomplete winking of the left lids. The left lids were more widely open than the right.

CASE III.—*Parallel Conjugate Deviation—Unequal Recovery of the Eyes.*

David T., a miner, about 50 years of age, was under the care of Dr. Sawyer in the Queen's Hospital in September, 1875.

About twelve months before admission there had been, according to the patient's statement, severe pain in the right side of the head and face, followed by "squinting of both eyes" to the right; the pain lasted about four or five months. There is no definite history of loss of power in the limbs.

At the time when I had the opportunity of examining this patient's eyes with Dr. Sawyer, the right eye had normal range of movement in all directions, while the left eye could not be turned towards the left beyond the median line; in short, the condition resembled that produced by paralysis of the sixth nerve. The patient, however, stated most positively that, at the outset, both eyes had been affected. There had been, he said, pain in the right forehead and temple, and both eyes had squinted to the right, "quite into the corners," and it was only lately that the right eye had recovered the power of turning towards the left.

CASE IV.—*Conjugate Movements Upwards and Outwards Lost—Convergence in Excess—Parallel Conjugate Movements Retained.*

Some notes of this case appeared in the Birmingham Medical Review for October, 1875. I repeat them here more fully, together with an account of a subsequent examination.

John G., a groom, aged 44, suffered in 1874 from great pain in the head, vomiting, double vision, and distressing giddiness. He recovered from this attack, and resumed work. In June, 1875, he was seized with a similar attack, and admitted into the Queen's Hospital, under the care of Dr. Heslop. On admission, there was severe pain in the head, vomiting, double vision, and the most distressing giddiness on attempting to walk, especially on making the effort to look upwards. The giddiness appeared to depend on the affection of the eyes, for with the eyes closed the patient preserved his balance perfectly, even with the feet close together. The condition of the eyes, when submitted to me for examination a week later, was as follows:—

The acuity of vision, refraction, accommodation, and ophthalmoscopic appearances, were normal in each eye. The patient's appearance was singular, by reason of an unnatural position of the eyes. They maintained a constant convergence towards a

point two feet distant from the face, and rather below the horizontal plane. A flame held at this distance was seen single, but at any greater distance it was seen double. The patient was unable to *diminish* to the smallest extent the convergence, so as to direct the eyes to a point more distant than two feet. When the flame was brought nearer to the face, in the horizontal plane, it appeared that there was very slight, if any, power of *increasing* the convergence; in short, *under this test*, it appeared that both external recti, and both internal recti, were paralysed. By lowering the flame while it approached, however, it was found that, in looking downwards, the eyes retained some power of increasing their convergence, but to what extent was not ascertained, as the movement appeared to be performed unsteadily. Vertical movement upwards, above the horizontal plane, was totally lost. The strongest effort to look higher than this, resulted only in slight vertical jerking movements in both eyes, and a little elevation, without jerking, of the upper lids, so as to uncover a little of the sclerotic above the cornea. With regard to parallel conjugate movements, the eyes were tested by moving an object from right to left, and from left to right, at a few feet distance. Both eyes followed the object to the normal extent in either direction, though when turned to the maximum in either direction, there was a little jerking of the eye turned inwards. They preserved, throughout, the degree of convergence before stated. *Under this test*, both external recti, and both internal recti, were active.

During his stay in hospital the pain in the head entirely disappeared; but the condition of the eyes, and the difficulty in walking, remained almost unchanged on his departure.

I have quite recently succeeded in tracing this patient, and am now able to add the following notes. He states that after leaving the hospital he slowly and steadily improved. The double vision disappeared, and he became able to look upwards. The giddiness disappeared at the same time. He could get about again without difficulty. All went on well until three weeks ago, when he caught cold: sore throat followed, then pain in the head and vomiting, and the eyes became as bad as ever again.

His present state is as follows:—The eyes maintain a convergence to a point eight inches from the face, and about three

inches below their own level, the face being vertical. The amount of convergence appears to vary a little, but it is not properly under control; it cannot be voluntarily diminished, but, on looking downwards at an object close to the face, it is somewhat increased. There is neither spasm nor paralysis of the accommodation. The pupils respond to light, and also contract with increase of convergence. The parallel conjugate movements are much less free than at the former examinations.

Tested by the horizontal and vertical movements of an object before the face, each eye is found to have the following range:—

Outwards, only a little beyond the median line, and much unsteadiness and jerking attends the effort.

Inwards, to the full extent, but with a little jerking.

Downwards, apparently to the normal extent.

Upwards, no movement is possible above the horizontal line, and much jerking attends the effort.

CASE V.—*Conjugate Movements Upwards and Outwards Impaired—
Convergence in Excess.*

Sarah G., a domestic servant, aged 26, unmarried, was admitted into the General Hospital, under the care of Dr. Russell, on November 24th, 1875, in a confused, semi-conscious condition, apparently hysterical. It was noticed that the eyes were strongly convergent. The history given by the patient is, that during the previous ten days she had been much overworked, and had suffered from headache and giddiness, and that while at the washing-tub she had become suddenly giddy, had attempted to speak to a person present, but had found herself unable to do so, and that she then fell to the ground, and remembers nothing more until she came to her senses the next day, just after her admission into the hospital. Two days later, when at Dr. Russell's request I examined the patient's eyes, their condition was as follows:—In distant vision the eyes were sometimes parallel, but on looking intently, one or other, generally the right, deviated inwards. In near vision, the tendency to inward deviation was greater than in distant vision. In attempting to look upwards the inward deviation attained its maximum; in looking downwards, it was at its minimum, and in this position the eyes

were for a short time properly directed; but one always soon deviated inwards, and parallelism was afterwards regained with much difficulty. Double vision accompanied the deviation. The movements of each eye, when tested by vertical and horizontal movements of an object before the patient, were as follows:—

Outwards, nearly to the full extent, but when approaching the maximum turning a very unsteady, jerking action occurred: the effort caused aching of the eye, and giddiness.

Inwards, to the full extent at least, probably farther, and with extreme contraction of the pupil.

Downwards, to the normal extent.

Upwards, to not more than half the normal extent at most, and with jerking, aching, and giddiness. The movements upwards and outwards appeared rather more impaired in the left, than in the right, eye.

The right eye had an apparent myopia $\frac{1}{30}$; it could accommodate up to about 15 inches, but not nearer; the left eye had an apparent myopia $\frac{1}{20}$; it could accommodate to about the same distance, or a little nearer. Four days later the eyes were again examined, having in the interval been brought fully under the influence of atropine. The apparent myopia proved to have been due to spasm of the accommodation; it had given way in each eye to hypermetropia $\frac{1}{30}$. All tendency to excess of convergence had disappeared, but the movements outwards and upwards still remained impaired in both eyes, and a little more so in the left than in the right.

The atropine was discontinued, and during the following few weeks the eyes slowly recovered their normal power of movement outwards and upwards; the movement upwards was the last fully to return.

I have recently (November, 1876) again examined this patient, and find that she now presents the usual symptoms of a slight hypermetropia and nothing more. Reading and sewing fatigue the eyes and cannot be long persevered in. When either eye is covered it deviates slightly inwards, but at once recovers its position on being uncovered. Double vision never occurs.

Glasses + 30 remove all difficulty. She says that the state of her eyes at the present time, namely, the difficulty and fatigue in reading and sewing (without glasses) is just such as it used to be before the attack.

CASE VI.—*Convergence in Excess, perhaps dependent upon Contraction of Tendons, and not upon Lesion of Brain-centre.*

F. J., a gentleman æt. 57, many years resident in India and lately returned to England, consulted me on account of double vision in the early part of September, 1876.

He stated that six months ago he suffered during several weeks from double vision. It came on without known cause, and to the best of his knowledge was not accompanied by any other symptom, excepting the consequent confusion and difficulty in walking. At the end of a week or two the double vision was quite recovered from. Three weeks before I saw him it had returned. The patient appeared in good health; he had no pain in the head or elsewhere; the last joints of one or two of the fingers of each hand were flexed and stiff, and the next joint in one finger was peculiar in that the articular surfaces seemed not to be properly in apposition, that of the distal phalanx being pushed somewhat backward over the edge of the other; the result was that the joint did not work freely but opened with a jerk; the patient said that he had had several attacks of prickly heat (*lichen tropicus*), and that in one of these the eruption had suddenly disappeared with immediate swelling of the hands and feet; the hands and fingers were flexed, and had remained in this position for some time after the disappearance of the swelling; the power of extending and using the fingers had been very slowly regained. The urine contained no albumen; the thoracic organs had been recently pronounced sound by an excellent authority; he had lately suffered much grief and anxiety from a domestic affliction, and was somewhat reduced in vigour and power of mental application.

The condition of the eyes was as follows:—Each eye had emmetropic refraction, and normal acuity of vision. In looking straight forwards in the horizontal plane, the eyes converged too much, and the excess of convergence was constant for all distances. It was barely neutralized by prisms of 5° with bases outwards. With the head exactly vertical, the images stood side by side on the same level horizontally, and they were both quite vertical; there was therefore no affection of the oblique muscles. On looking a little upwards the images stood nearer together (the convergence was diminished), and on looking con-

siderably upwards, single vision was obtained. On looking downwards the images stood further apart (the convergence increased). Each eye when tested alone, moved *upwards* and *downwards* to the normal extent, *inwards* to a little more, and *outwards* to a little less, than the normal extent; in short, except for the disturbing influence of the constant excess of convergence, the *parallel conjugate* movements were properly performed. The movements of convergence were also freely performed, that is to say, the amount of convergence was altered at will, but for every distance it was in excess. There is confusion as to the position of objects, and it is with difficulty that the patient walks alone in the street. Prisms of 5° , bases outwards, were prescribed for present use.

Bromide of potassium, in considerable doses, having produced no effect on the amount of the deviation as measured by prisms, small doses of strychnia were prescribed. At the present time, after four weeks, there is a very slight improvement. The prismatic glasses now neutralize completely, and afford much comfort. With their help single vision is obtained at all distances, and there is no difficulty in walking.

Prisms of the same strength combined with + 18 spherical lenses are prescribed for reading.

The foregoing cases are incomplete in many points, and in no instance has there been an opportunity of ascertaining the site and the nature of the lesion by post mortem examination. They present, nevertheless, points which appear to me deserving of notice. I venture to draw attention especially to the following facts and considerations:—

1. In Case I parallel movements were lost, while convergent movements were retained, a state of things which involves alternate conditions of paralysis and activity in each of the muscles concerned; for example, the internal rectus of each eye is paralysed or active, according as the attempted effort associates it with the external or the internal rectus of the other eye, a proof that it is actuated by two distinct brain-centres, one of which may be injured without loss of power in the other.

2. In Case I the parallel conjugate deviation was not accompanied, as it usually is, by hemiplegia; hemiplegia appeared later, when the eyes had to a great extent recovered their power of movement, and its onset brought with it no fresh deviation of the eyes. The ocular deviation and the hemiplegia both pointed to disease in the same side of the brain. I would further observe that, supposing the patient to have been accurate in his statements, the order of the return of power in the extremities was not the usual one, but no weight can be attached to this in the absence of more exact information.

3. In Cases I and II, which were seen within the first few weeks after the onset of the ocular deviation, the eyelids on the side from which the eyes turned were more widely opened and winked more feebly than on the other side. This was due to partial facial paralysis. In both these cases it was noted that the eyelids on the side towards which the eyes turned winked more frequently than in health. The exposure of the other eye, through paresis of its orbicularis, probably induced a more frequent effort to wink, and this effort acted in full intensity on the unaffected eye, feebly on the affected one.

4. In Cases I, II, III, after parallel conjugate deviation, the eye which turned outwards, that is, the eye on the same side as the brain lesion, recovered its movement at an earlier date than did the eye turned inwards; the internal recovered earlier than the external rectus.

5. Case IV forms a counterpart to Case I. The movements lost in the one were retained in the other, and *vice versa*. In Case IV, the conjugate movements upwards and outwards, by which we look at a higher and more distant object, were lost; the conjugate movements downwards and inwards, by which we look at a lower and nearer object, were retained; the centre presiding over the latter movements, being unopposed, maintained the eyes in a direction downwards and inwards, and was able to produce a further movement in this direction, but did so with deficient steadiness and pre-

cision, in consequence of the lack of the balancing action of the opposing centre. Locomotion was much interfered with in this case. (See Dr. Hughlings Jackson on Representation of Ocular Movements in the Cerebellum, Vol. VIII, page 338 of these Reports.)

6. Variations in the amount of convergence are accompanied, in health, by corresponding variations in the amount of accommodation. In Case IV convergence was in excess, but there was no corresponding increase of accommodation—each eye alone could relax its accommodation in the normal manner for distant vision. It would appear probable that the centre for movements upwards and outwards has no antagonistic power over the accommodation. The *accommodation* of the eye for distance is purely passive, it is not action but suspension of action—the ciliary muscle has no antagonist. The *directing* of the eyes for distance, on the contrary, involves action, namely, contraction of the external recti and some other muscles. From this it follows that paralysis of the centre in question must produce increase of convergence (downwards and inwards), but no increase of accommodation; the internal recti, *without effort*, draw the eyes inwards because they have lost their opponents, the ciliary muscles gain no power because they have no opponents to lose.

The supposition, then, that convergence and accommodation are presided over by one and the same brain-centre, is not invalidated by the symptoms observed in this case. The well-known fact that the relation between the degrees of convergence and accommodation is not absolute, but admits of variation within certain limits (see Donders, p. 110), is apparently opposed to this supposition of a common brain-centre for the two acts; that it is not so will, I think, appear from considerations in the next paragraph.

7. In Case V the conjugate movements upwards and outwards were temporarily impaired but not totally lost. The hypermetropia probably played here an important part. The hypermetropic eye, in order to obtain distinct vision, must for every distance accommodate more than the normal eye; now if

convergence, as is supposed, is governed by the same brain-centre as accommodation, the hypermetropic eye must, for every distance, converge too much. As a fact, however, a large number of hypermetropic eyes preserve their parallelism, but they do so with an effort; the position of ease and equilibrium for the hypermetropic eye is one of more or less inward deviation. It would appear probable that the effort by which parallelism is maintained, represents an activity in the brain-centre which opposes the movements of convergence. If this be so, we have at once an explanation of the variable relations between the degrees of convergence and accommodation which exist within certain limits in all eyes. In the case of hypermetropia, the muscles of accommodation have to act in excess, *consequently* the muscles for convergence act in excess; *consequently* the muscles for divergence, if parallelism is to be maintained, have to act in excess also; hence the fatigue proper to the hypermetropic eye.

In Case V it appears that in connection with a temporary nervous disorder, the pathology of which I can make no attempt to explain, but which may be classed as hysterical, the centre for conjugate movements upwards and outwards became much weakened. That the affection was not, at any rate entirely, a spasm of the convergent and accommodative movements, is proved by the fact that although atropine removed the power of accommodation, and with it the tendency to excessive convergence, it did not by so doing at once restore the lost power of movements upwards and outwards. The latter returned gradually during the course of several weeks.

8. Case VI ought perhaps not to be included in this group of bilateral affections of the eyes. At first sight it certainly appears to be a case of bilateral deviation dependent upon central disease, for there was no discoverable paralysis of any one individual muscle, and the impairment of movement outwards was found to be present in each eye equally. But, on consideration, the supposition of a central lesion appears to be negatived by the following facts:—The amount of deviation

is constant for all distances, and when neutralising prisms are worn, single vision is obtained at all distances, and the movements of convergence are performed with ease and precision. This is quite at variance with the conditions in Case IV.

Again, movements upwards are neither lost nor impaired, which precludes the diagnosis of lesion in the centre for conjugate movements upwards and outwards, and the existence of a centre for simple movements of convergence in the horizontal plane has not as yet, I believe, been demonstrated or asserted. Symptoms precisely similar to those presented by this patient would, I imagine, be produced by a slight contraction of the tendons of the internal recti muscles. Whether such a cause was in operation here is a matter for conjecture only.

The flexed condition of the hands from which the patient suffered recently, and which still remains in certain of the fingers, is worth noting in connection with this suggestion, although it would certainly be unsafe to point to it with any stress.

CASE OF CYST IN THE ANTERIOR CHAMBER.

By FREDERICK MASON,

Surgeon to the Bath Eye Infirmary.

MARY ANN GOOD, aged 71, came to the Bath Eye Infirmary on 14th October, 1875, and complained of pain and irritation in the left eye. She stated that twenty years ago she began to lose sight in that eye, but, not having pain, she did not seek advice for four years, when she applied at the Infirmary, and saw the late Mr. Boulton, who said she had cataract. Eight years ago she was staying at a house in Bristol, where Mr. Prichard was visiting. He saw her casually, and also told her she had cataract. She did not ask further advice until the day mentioned above. She had never met with an accident of any kind to the eye. At the first glance (and knowing she had travelled some distance by railway, rendering it possible that some foreign body had entered the eye), I thought from the appearance that there were two particles of lime (white in colour) sticking on the surface of the cornea, but on more careful examination these were found to be in close contact with the inner surface of the cornea, or rather within a cyst which filled the lower part of the anterior chamber. The cyst was tremulous, semi-transparent, and filled with clear fluid, and, whilst under observation, expanded upwards so as to partially cover the pupil. It was unattached and loose in the chamber, for on laying the head towards the right shoulder the cyst sank to the most depending part, and the same occurred when the head was turned to the left. The pupillary space was clear; there was no appearance of cataract, and no perception of light. The eye was suffused with ciliary redness at the lower margin of the cornea, and latterly had become irritable and painful.

She was excessively nervous, and afraid of being placed before the lamp, therefore only an imperfect ophthalmoscopic examination could be made.

The fundus was of a creamy-white colour; the optic disc could not be seen, but I fancied I perceived some of the vessels of the retina.

She could not give me any idea of the length of time the cyst had been in its present position; but as it was now certainly setting up the irritation of a foreign body, I advised her to

become an in-patient, in order that I might remove it. This she did on the 19th October. On this day another attempt was made to examine with the ophthalmoscope. The vessels of the retina were not perceptible, but a dense yellowish-white film floated deep in the eye, obscuring all view of the fundus.

October 22nd.—*Operation.* The head being turned on the right side, the cyst dropped away from the point of an iridectomy knife with which an opening was made in the lower margin of the cornea to the full width of the knife: the head being now turned so as to lie on the back, the cyst came to the opening, and, being partially expelled with the aqueous, was easily seized with forceps, and removed. A portion of unhealthy-looking iris, against which the cyst had been resting, was drawn out and excised, and then an opaque body, which had been lying behind the iris, came into view. On attempting to remove this, it retired behind the upper segment of the iris, so that only the lower margin could be seen, and, after several ineffectual attempts had been made to dislodge and extract it, I thought it better to leave it for a future operation, if necessary.

This cyst not being the result of, nor following, any injury to the eye, and being unattached to either the cornea or iris, but lying loose in the chamber, did not resemble those cysts of the iris described by Mr. Hulke in the 6th Vol. of the "Ophthalmic Hospital Reports," and, being in doubt as to its real nature, I sent the cyst, with the portion of iris excised, to Mr. Hutchinson, asking him kindly to give me his opinion. He placed the specimens in the hands of Mr. Nettleship, to whom I am indebted for the following report.

"The cyst has collapsed, being open widely on one side. It consists of a hyaline, transparent membrane. Within or upon it, at different parts, there are groups or masses of calcareous granules, which dissolve with effervescence in nitric acid; collections of pigment granules; and numerous scattered cell-forms of the kind commonly met with in inflamed vitreous, viz., fusiform and multipolar corpuscles, and nests composed of several or many oval or rounded corpuscles, most of the elements of these nests being much degenerated. In parts the cyst-wall, seen in section, or acutely folded on itself, shows a distinct appearance of lamination, sometimes several, sometimes only two, layers being apparent; in thickness it considerably exceeds the healthy lens-

capsule, but resembles that structure in showing some tendency to curl up at the cut edges. No distinct evidences of the suspensory ligament were noticed. There was nothing resembling a hydatid.

“From the general characters of the cyst, I feel no doubt that it is the ruptured lens-capsule, somewhat contracted and thickened, containing small remnants of calcified lens, and having attached to it some shreds or membranes of vitreous in a state of chronic inflammation. The lamination observed is sometimes seen in thickened capsules.

“Attached near to the ciliary border of the piece of iris removed at the operation, was a mass of flocculent soft substance, which, when spread out, was much larger than the portion of iris. It contained a quantity of scattered uveal pigment, and in parts some round, rather small, corpuscles; it had no structure, but was of a stringy consistence, like the vitreous, and perhaps consisted of a portion of that substance, altered and mixed with pigment from the ciliary processes, or the back of the iris.”

November 2nd.—The opaque body observed behind the iris, and which probably was the remains of the lens, has not again come into view. The pupillary space remains clear and black. Iris not inflamed; the wound healed; there is slight ciliary redness to the extent of the wound.

Ophthalmoscope: Light does not pass into the eye.

She wished to go home, and left the infirmary.

I can offer but little in explanation as to the reason why the capsule of the lens became separated from its attachments, and afterwards came into the anterior chamber. I can only suggest that, twenty years before, when she first lost sight, she suffered from choroido-retinitis, the vitreous then became complicated in the chronic inflammation, and afterwards the lens became opaque; so that at the time when seen by Mr. Boulton and Mr. Prichard, the case would resemble an ordinary one of cataract. From some cause, shortly before I saw her, the lens swelled, and, being pressed forward against the iris, caused the pupil to dilate; the capsule ruptured, became detached, and fell through the dilated pupil, which, being relieved of pressure, afterwards contracted to its normal size. I think this could only have occurred a few days before, as she was only then beginning to suffer pain from irritation and inflammation.

TWO CASES OF AIR-BUBBLES IN THE VITREOUS FOLLOWING PERFORATING WOUNDS.

By A. STANFORD MORTON, M.B.,

Late House Surgeon to the Moorfields Hospital.

THE two following cases may be of some interest as illustrating a hitherto unrecorded condition, and also as showing how this condition may be mistaken for something totally different.

CASE I.—Thomas R., æt. 42, came to this hospital, August 26, 1875, on account of an accident, after the surgeons of the day had left. Upon examining his right eye I found a penetrating gaping wound of the sclerotic with the vitreous presenting; situated about one-third of an inch from the lower and inner margin of the cornea; and caused, as the patient stated, by a small chip of steel which flew off from his chisel an hour or two previously. After dilatation of the pupil with atropine, I examined the interior of the eye to see if I could find the piece of metal which had caused the injury. The optic disc could not be seen owing to effusion of blood into the vitreous, but just above and to the outer side of the macula lutea there was a mass with a bright metallic lustre which I took at first to be the piece of steel. On closer examination I saw that the peculiar metallic lustre was caused by a bubble about as large as the optic disc, flattened, bright at the centre, and bounded by an uniform dark zone equal in thickness to about one-tenth of the whole diameter. A group of smaller bubbles was present on its surface, another group just at its margin, and a third collection of four or five completely detached from it to its lower and inner side. The whole of them had the appearance above described, which was in fact precisely that of a bubble of air as seen in a microscopic preparation, and I therefore concluded that the appearances could only be due to air in the vitreous humour carried in by the chip of metal. Twenty-four hours later only one of the bubbles was left and it was much smaller. Thirty-six hours after the injury not a trace of them was to be found, the spot where they had been being occupied

by a peculiar crescentic white patch, having all the appearance of sclerotic showing through ruptured choroid. The patient remained in the hospital for a few days, but as he suffered from no pain nothing was done to the eye. He returned just twelve months later at my request, when on examination I found extensive detachments of the retina, but could not see either the disc or the crescentic patch just mentioned. I may mention that the case was seen by Dr. Buller, now of Montreal, and Dr. Knapp of New York, both of whom fully concurred in the opinion that the appearances were due to air.

CASE II is very similar to the preceding.—Alexander G., æt. 39, presented himself at the hospital on February 10, 1876, after the surgeons had left, having been struck a few hours previously by a chip of metal in the left eye, in the ciliary region, to the lower and inner side of the cornea. The field was very much contracted, vision remaining only at the part corresponding with the upper and nasal quarter of the retina. Being asked to examine the patient, because it was thought that a piece of metal could be seen in the eye with a distinct metallic lustre, and bearing the former case in mind, I made a careful inspection and found the lustrous appearance to be due, as in the former case, to three flattened bubbles placed in a row, and each one slightly overlapping the other. Each bubble was about as large as the optic disc, and they were situated about a disc's breadth from it, at the lower and inner part of the fundus. They presented precisely the appearances described in Case I, and Mr. Pye-Smith, who also examined the case, fully agreed with me that the presence of bubbles of air in the vitreous was conclusively proved by the peculiar appearances.

These two cases are instructive as well as interesting, inasmuch as in both it was thought that the lustrous chip of metal could be seen by the ophthalmoscope, but as shown in both this was an erroneous conclusion. Unfortunately the subsequent history of Case II is unknown, as the patient, though advised to remain in the hospital, refused to do so, and never returned.

THE AFTER-HISTORY OF FIFTEEN CASES OF MALIGNANT
TUMOUR OF THE EYEBALL.

BY EDWARD NETTLESHIP, F.R.C.S.,

Surgeon to the South London Ophthalmic Hospital.

IN the following notes are recorded the present condition of some patients operated on for various malignant diseases of the eyeball, during the time that I was Curator of the Moorfields Museum (1871-73). They form a considerable majority of all the cases of this class, which were under care at the Hospital during the time specified; there were, however, several others in which I have not been able to learn the result. The interval which has elapsed since the cases were under care (from $2\frac{1}{2}$ to $5\frac{1}{2}$ years), is long enough to render it highly probable that those who have up to the present time escaped a return of the disease will remain permanently cured. In one case only (No. IX), the interval was too short to ensure a probability of permanent safety, and I have not been able to trace this patient since.

In the cases of sarcoma of the choroid (Cases I to X), we may note that when a return, either local or general, occurred (Nos. II, IV, VII, and VIII), there was always good reason to think that the primary disease had been in progress for several years before the removal of the eye; and that there was a strong family history of malignant disease in at least two of these (Nos. II and VIII). In three cases (Nos. I, VII, and VIII), there was a large growth external to the eyeball at the date of operation. The disease returned locally in two (Nos. VII and VIII), while in one of these two (No. VII), and in two others (Nos. II and IV), there were abundant deposits in distant organs; in (No. VIII) the evidence on this head is imperfect. In none of them is there any note that the lymphatic glands connected with the eye were

affected at any stage. The interval between the operation and return was considerable in Cases II and IV, but very short in Nos. VII and VIII, where the return was local.

In the five or six cases where no return has taken place (Nos. I, III, V, VI, X, and perhaps IX), the disease had begun about a year before excision in Nos. I, III, and X, and was of five years' duration in No. V; there was a family history, more or less strong, in Nos. III and VI; in one (No. III), the greater part of the disease was extra-ocular and deeply seated in the orbit; and in another (No. I), there were also some deposits on the exterior of the sclerotic, but only at the front of the globe; in both these cases, however, there was reason to think that the disease was of short duration. In one case (No. V), where the growth had probably begun five years before excision, it distended the eyeball, but had not visibly escaped into the orbital tissues.

Only four cases of glioma of the retina are included here. In two of them the removal of the eye has been successful (Nos. XI and XIII), and in both of these the disease was in an early stage and confined to the eye. In the other two (Nos. XII and XIV) there was a growth on the outersurface of the sclerotic, with doubtful infection of the optic nerve in one (XII), and very marked implication of the nerve in the other (XIV). In both cases the disease returned locally and quickly.

Some of the cases recorded below have already been published at greater length in earlier numbers of these reports, the others are now given for the first time.

CASE I.—John Moules, æt. 62. Mr. Wordsworth. Melanotic sarcoma of ciliary body and choroid, giving rise at an early stage to secondary growths on the outer surface of the sclerotic in the ciliary region. No thinning or perforation of the sclerotic, the growth having extended along the perforating blood-vessels. The intra-ocular tumour constricted near its base. Retina still *in situ* at the part furthest from the tumour, and patient able to see shadows with this part. Duration of growth uncertain, but the first symptom definitely noticed by the patient was the appearance of one of the secondary growths on the sclerotic eight or nine months before

excision. No inflammatory symptoms at any time, and he applied on account of the defective sight. No family history of tumours.

Date of excision: September 30, 1871.

October, 1872.—Came at request. No return; health good.

October, 1876.—Writes that he is quite well and has had no return. (See *Ophth. Hosp. Reps.*, Vol. VII, p. 385.)

CASE II.—Martha Garrard, æt. 38, married. Mr. Critchett. Melanotic sarcoma of choroid with perforation of sclerotic and a large extra-ocular growth at the back of the eye to the inner side of the optic nerve.

Loss of sight, without pain, four years ago, soon after her sixth confinement. Two years ago first began to have severe shooting pain around the eye, &c. One year ago, soon after her last confinement, the eye noticed to be enlarging.

Cancer of breast in a sister.

History of loss of one eye, from inflammation followed by shrinking, in her father and in two of her sisters, one of them the same who died of cancer.

Eyeball nearly filled by the growth and enlarged and perforated. The tumour had a very broad base extending from close to the disc up to the ora serrata. Lens opaque.

Date of excision: August 4, 1871.

January, 1872 (five and a half months).—A mass of healthy-looking granulations as large as a pea springing from centre of conjunctival scar, but not pigmented, and no signs of return of malignant growth.

September (thirteen months).—Husband states that she is in St. Bartholomew's Hospital for "tumour of the womb."

I was unable to trace her afterwards, but Dr. F. H. Champneys, Medical Registrar to St. Bartholomew's, has lately been kind enough to supply me with an abstract of the notes of her case while under care there. There was great abdominal enlargement, due to the presence of a large undefined nodular tumour seated chiefly in the right lumbar, hypochondriac, epigastric, and hypogastric regions; the nodules varied from the size of a pea to an egg. The liver dulness was very greatly increased. There were also three little nodules under the skin, one below the left breast and two on the abdomen. On admission she was supposed to have fibroid tumour of the uterus, but this organ was found to be healthy. She left the hospital in two months, and the final

result is unknown ; but from the above facts there can be little doubt that she was suffering from extensive secondary malignant growths in the liver, &c. On admission, it is stated that the glands in both groins and in the left axilla were somewhat large, but those in the neck normal. (See Vol. VII, p. 389).

CASE III.—Thomas Thomlinson, æt. 45. Mr. Hutchinson. Melanotic sarcoma, beginning at the region of the yellow spot apparently in the outermost layer of the choroid (*lamina fusca*, *membrana supra-choroidea*) ; passing outwards along the course of the perforating (short ciliary) blood-vessels, and producing a large tumour outside the eye, but none at all within the globe. Considerable proptosis. Symptoms began with proptosis about a year before excision.

History of cancer of nose in the patient's father and of tumour of the breast in a sister of the father.

Date of excision : January 15, 1872.—The tumour was about as large as a walnut, very soft, and surrounded by a thin capsule ; it was easily turned out with the finger after the globe had been removed. Portions of orbital tissue, some containing melanotic nodules, were removed afterwards, and a second piece of the optic nerve removed as far back as possible. The tissues at the back of the orbit seemed healthy. Chloride of zinc paste was applied and caused sloughing of the greater part of the soft orbital tissues with exfoliation of some fragments of bone.

October, 1876.—Writes that he is quite well and has no return. (See Vol. VII, p. 611.)

CASE IV.—J. Abel, æt. 45. Mr. Lawson. Spindle-celled, partially melanotic sarcoma of the choroid of right eye, probably of four years' growth ; affecting a very large area of the choroid and invading the inner layers of the sclerotic. Optic nerve healthy. No reason to suspect that there were any visible extra-ocular growths in the orbit.

Date of excision : December 15, 1871.

January, 1873 (thirteen months).—Attended at request. No signs of local return ; no enlarged glands in the neck.

October, 1875.—Admitted into the London Hospital with paraplegia as high as umbilicus, and involving the bladder and rectum. It had come on suddenly during a single night a month before admission. There was also a large hard mass in the right axilla probably attached to the scapula, of six or eight months' duration ;

it was considered to be malignant. He died on December 9, two months after admission, from exhaustion due to cystitis. At the post mortem a large parsnip-coloured lobulated tumour was found attached to the under surface of the right scapula and extending into the surrounding muscles; it was inseparable from the bone substance. A tumour attached to vertebral arch at ninth dorsal pressing on the cord, which was here softened for an inch. Caries of spine at second lumbar vertebra but no change in the cord at that part. No malignant growths in thoracic or abdominal viscera. Brain appeared healthy. (Notes supplied by Mr. Roland D. Smith, Medical Registrar.) (See Vol. VII, p. 613.)

CASE V.—George Aggus, æt. 50. Mr. Lawson. Melanotic sarcoma of choroid, filling the eye and causing perforating ulceration of cornea and considerable thinning and bulging of the sclerotic in front of the equator. Duration of growth probably five years, with long periods of quiet. No family history of cancer or tumours. No enlarged glands. No visible affection of the extra-ocular tissues.

Date of excision: April 2, 1872. Chloride of zinc paste applied to the orbit and followed by separation of a large slough, but some of the soft tissues remained.

Six and a half months later he wrote that he was quite well.

October, 1876.—In reply to inquiry he writes that he is quite well and has no return. (See Vol. VII, p. 615.)

CASE VI.—An old gentleman, æt. 78, a private patient of Mr. Streatfeild. Unpigmented sarcoma (probably of choroid), originating in an eye which had been blind and shrunken for many years. The tumour passing through the hinder part of the sclerotic, infiltrating the optic nerve near the eye, and producing a large extra-ocular, well-circumscribed mass of growth. The entire tumour of large size and causing protrusion of the shrunken eye; consistence somewhat firmer than usual; composed of large spindle-shaped cells. No disease of the proximal end of the optic nerve. History of tumour, probably malignant, in a cousin of the patient, an old lady. Duration of growth in patient uncertain.

Date of excision: January, 1872.

October (ten months).—Mr. Streatfeild saw him, and found him in good health, and with no sign of a return.

I have lately heard from Mr. Streatfeild that the patient lived for two years after the operation, that he is reported to have died with "inflammation of the lungs and diarrhoea," and is believed to have had no signs of malignant disease. (See Vol. VII, p. 616).

CASE VII.—Mr. Wm. F., æt. 69. Mr. Lawson's patient in private. Sarcomatous tumour, almost free from pigment, growing within and outside an eyeball which had been blind for several years from disease of cornea (probably large perforating ulcer). Previous history of an injury. Sarcomatous infiltration of choroid and retina, with signs also of chronic inflammation; tumour projecting from optic disc into vitreous; infiltration of optic nerve for a long distance behind the eye; and a large tumour surrounding the distal end of the nerve, and attached to the outer surface of the eyeball. Eye had been liable to attacks of pain for several years; proptosis began four or five months before excision.

Date of excision: January, 1872.

Mr. Lawson informs me that the patient died about eight months after the operation, with all the signs of secondary internal deposits in the liver, and perhaps in other organs. (See Vol. VII, p. 277, where a wood-cut of the specimen is given.)

CASE VIII.—Emily Benson, æt. 53. Mr. Critchett. Melanotic sarcoma of choroid, completely filling the eye and extending through the sclerotic at the posterior part; the optic nerve so much affected that it could not be identified. Duration of growth five years or more. Sight lost, with symptoms of glaucoma, in one year. Three years before excision she consulted a distinguished oculist, and was advised to have nothing done, and that the eye would probably wither away. It shrunk for a time, and then began to enlarge, and at date of excision the front of the eyeball, itself puckered and shrunken, was pushed forwards by the growth behind. She had begun to lose flesh.

A sister died of a large tumour "in the stomach," which the doctor had attempted to tap without success. A paternal aunt died of cancer of the breast, æt. 50, and a first cousin (female) likewise on the father's side, died also of cancer of the breast.

Date of excision: March 8, 1872. Part of the diseased continuation of the optic nerve could not be removed. Chloride of zinc applied. No enlarged glands. It rapidly recurred

and filled the orbit; for a time she had intense pain, but this subsided.

February 12, 1873 (eleven months).—Died. The tumour had invaded the whole of the forehead and side of the face down to the chin, but she had continued free from pain. There had been passage of dark grumous blood from the nostrils. She died "in stupor." (Moorfields Register, No. 157.)

CASE IX.—Ellen Murphy, æt. 45. Mr. Streatfeild. Melanotic sarcoma of choroid, confined to the globe. Duration of growth, judging by the history of symptoms, five years. Eye became blind gradually in about one year, and she had several months of pain after the failure had been going on for some time. It again inflamed a few weeks before admission. No known history of cancer or tumours in the family.

Date of excision: May 30, 1872. There was a yellowish cataract, and the eye was soft.

October 24 (five months).—No return; no enlarged glands. I have been unable to trace her since. (Moorfields Register, No. 201.)

CASE X.—Lavinia Barnes, æt. 18. Mr. Hulke. Melanotic sarcoma, arising in the ciliary body at the seat of an injury. Operation for traumatic cataract twelve months after the accident, and excision of the eye for pain and inflammation about five months later (a year and a half after the injury). The tumour as large as a small cherry, and confined to the ciliary body, but beginning to encroach on the iris and cornea. Family history wanting.

Date of excision: December, 1872.

July, 1875—She wrote that she was quite well, and had no return. (See Vol. VIII, p. 264.)

CASE XI.—George Croydon, æt. 3. Mr. Critchett. Glioma of retina in one eye, of at least six months' growth. It extended into the vitreous instead of growing outwards, and the retina was not detached. A thin layer of glioma tissue was adherent to the inner surface of the choroid at the part where the retinal growth was largest; the pigment epithelium was removed from this part, but no penetration or infiltration of the choroid itself had occurred. There were also some clusters of cells on the ciliary processes, but here the pigment epithelium was undisturbed. Some clusters of glioma cells were found in a transverse section of the optic nerve close to

the eye, and at the time I described these as an "extension of the disease into the optic nerve." Subsequent examination of other specimens, however, has shown that the appearances above described were almost certainly due to the accidental introduction of some glioma tissue in making the section.

Date of excision: May 23, 1871.

August.—A large lump of granulation tissue was brought by the child's mother, it having recently come away from the orbit. (Microscopical examination).

December.—Still a good deal of muco-purulent discharge from orbit. No return.

September, 1876.—Mother reports him quite well. (See Vol. VII, p. 217.)

CASE XII.—Thomas Jeffrey, æt. 4. Mr. Critchett. Glioma of retina filling the eye, and protruding at the ciliary region; another smaller growth on outer surface of sclerotic at back of eye; doubtful infection of optic nerve. Symptoms noticed for eighteen months before excision. The child's mother died young, with a history pointing to tumour in the nose.

Date of excision: August 27, 1872.

December.—Reported to be in good health and to have no return.

June, 1873.—Brought to the hospital again with a large hard mass filling the orbit and protruding the lids. An enlarged moveable gland the size of a chesnut in front of the ear, and a larger one adherent to the adjacent parts behind the angle of the jaw. (See Vol. VII, p. 609.)

CASE XIII.—A child, æt. $2\frac{1}{2}$. Private patient of Mr. Critchett. Glioma of retina sprouting into the vitreous and not causing detachment of retina. Optic nerve not affected. Almost the entire retina the subject of general gliomatous thickening with more or less defined nodules. Vitreous clear, but patches of glioma cells adherent to its outer surface in some parts. Duration eighteen months or more, a white reflex having been noticed nearly a year and a half before excision. No pain. Eyeball less than half filled by the new growth.

Date of excision: August 1, 1871. Mr. Critchett removed a second piece of the optic nerve after removing the eye; somewhat troublesome bleeding was the result, and the actual cautery was needed in order to arrest it. Quickly recovered.

October, 1876.—Mr. Critchett informs me that he believes

the child to be still alive and well, having heard nothing of the case since the operation.

(Preserved in the Moorfields Museum, No. 6, Series V.)

CASE XIV.—Alfred Hills, æt. 6. Mr. Critchett. Notes by Dr. Buller. Glioma of retina growing into the vitreous, and very nearly filling the eye; retina not detached, but its choroidal surface marked by little sulci. Patches of glioma adherent to choroid, but no evidence to the naked eye of infiltration of this structure. Ocular end of optic nerve thick and firm; a second piece removed, and its proximal end appeared healthy to the unaided eye. Duration of growth uncertain; symptoms ("something unusual in the eye") noticed by parents only a few months.

Date of excision: May 13, 1873.

August 18.—Came again with a return of growth nearly filling the orbit. Excised, and chloride of zinc paste applied and left in the orbit for one day.

He died on November 19th of the same year, with extensive local return of the disease, but no further details could be obtained from his parents. (Moorfields Register, No. 365.)

CASE XV.—Alice Elder, æt. 27. Mr. Couper's patient. Growth, probably from its structure an inflamed sarcoma, from the right lachrymal sac. A tumour had been first noticed three years previously, and one year after its first appearance it was removed by Dr. Argyll Robertson. The patient stated that it was called a "fatty tumour." It recurred after removal, and a second operation was advised by Mr. Walker, of Edinburgh, a year after the first. It was afterwards seen by another oculist, who used probes for some weeks to overcome the obstruction, and then removed the growth. It quickly recurred and, about three weeks later, Mr. Couper again removed it (making the third operation), and three days afterwards applied chloride of zinc. No family history of tumours or cancer.

Date of Dr. Argyll Robertson's operation, about December, 1869.

Date of second removal, November, 1871.

Date of third operation, by Mr. Couper, December 12, 1871.

October, 1872.—Writes that there are no signs of a return.

I have not been able to hear of her since. (Moorfields Register, No. 120.)

CASE XVI.—For the details of another case of melanotic sarcoma

of choroid with extra-ocular tumour, in which the disease returned locally, after excision followed by the application of chloride of zinc, the patient dying six months later with multiple deposits in various organs and in some of the bones, see the Pathological Society's Transactions for 1871-72, p. 251. The case is recorded by Mr. Andrew Clark, then Pathological Registrar at the Middlesex Hospital, whither the patient had been transferred after excision of the eye and tumour by Mr. Lawson, at Moorfields. There was no family history of malignant disease or tumours. (Moorfields Register, No. 60; Ellen Moore, æt. 62.)

HOSPITAL CASES.

Reported by A. STANFORD MORTON, M.B.,
Late House Surgeon to the Moorfields Hospital.

Two Cases of Pannus treated by Inoculation.

CASE I.—Thomas D., æt. 33, was admitted, October 2, 1875, under the care of Mr. Bowman, suffering from a deep marginal ulcer, chronic ophthalmia and granular lids of the left eye; after treatment he was discharged, October 22, with the ulcer nearly healed. On January 3, 1876, he was again admitted, with the same condition, and was again discharged better; but as soon as he returned home he invariably became worse, and was re-admitted February 25. The lids were now treated with nitrate of silver, and the ulcer occasionally touched with the same, under which treatment the ulcer nearly healed; but the whole cornea becoming very vascular, Mr. Bowman performed peritomy, dissecting back from the margin of the cornea at least $\frac{1}{4}$ inch of the conjunctiva all round, and producing, as a result, only slight improvement. He was again discharged, April 8, but returned two days afterwards, worse. As no ordinary treatment seemed to succeed, Mr. Bowman determined to try inoculation. For this purpose the right eye, which was perfectly healthy, was secured from danger by a square sheet of india-rubber, with a watch glass securely cemented into an aperture in the centre, the whole being fixed to the side of the nose, forehead, and outer side of cheek by strips of strong plaster covered with collodion. Some white healthy pus from an infant four weeks old, who was recovering from ophthalmia neonatorum, was put inside the lower lid of the left eye: this acted well, and by the second day after the inoculation there were all the symptoms of acute purulent ophthalmia, which was left altogether without treatment, except a little tepid water with which the patient bathed his eye occasionally after the third day. About six weeks after the inoculation all discharge had ceased, and in the seventh week the right eye was set at liberty, not having suffered in the least. At the date of the inoculation the

pannus was so complete that the patient could not see to count his fingers; at his discharge, on June 16, he could read J. 20 at 6 inches. On October 28, he could read J. 4 at 8 inches slowly; the cornea was fairly clear and all inflammation had subsided, but he appeared to have had some iritis, the pupil being small and inactive.

CASE II.—Henry W., æt. 20, was admitted, under the care of Mr. Critchett, on May 5, 1876, with complete pannus of both corneæ, ectropion of both lower lids, and great photophobia. He had suffered for twelve years, and on admission was unable to count fingers with his left eye, and barely able to do so with his right. He was inoculated by pus from an infant four weeks old, recovering from ophthalmia neonatorum, both eyes being done at the same time. On the second day it was evident that both had fairly taken, and, as in the last case, the only treatment was bathing with tepid water occasionally after the third day. By June 8 there was scarcely any discharge remaining, and the vision was, with the right, fingers at 14 feet; with the left, fingers at 6 feet. At date of discharge, July 1, J. 18 slowly with either. A few weeks later on, in August, he could read with the right, J. 2, and with the left, J. 8; and on October 28 he had further improved to reading with his right eye, J. 1, and with his left, J. 4.

A peculiar form of Interstitial Keratitis in Secondary Syphilis.

Under the care of Mr. WORDSWORTH.

(See Figs. 3 and 4. Plate L)

The following case is interesting, as exhibiting an exceedingly rare, if not unprecedented, condition, viz., interstitial keratitis accompanying acquired syphilis. The patient, Annie P., æt. 25, was admitted on November 10, 1875, under the care of Mr. Wordsworth, and was also frequently seen and examined both as to the eyes, and the rash, &c., by Mr. Hutchinson and others. She had intense photophobia, great ciliary injection and tenderness, with haze in the centre of each cornea, and greyish-yellow deposits of lymph at the periphery, triangular in shape, with the apices converging towards the centre. On looking obliquely through the cornea each iris could be seen to be freely moveable to the stimulus of light. Her history was, that in the previous June, she had a

miscarriage at the third month, at which time her left eye inflamed, and, a month later on, her right eye also inflamed with violent pain; they became better, so that she could see well for a week; both, however, relapsing and continuing inflamed so that she sought advice here. Heurteloup's artificial leech was applied to each temple with considerable advantage, the congestion and pain becoming less, but the improvement was only temporary. She was then put on mercurial treatment, which was continued almost uninterruptedly until her discharge from the hospital. On examination she was found to have sores on her labia majora, like ulcerated mucous tubercles, though they were said to have come on as boils; a week or two after admission she also had a well-marked secondary syphilitic eruption, with slight sore throat, and during the last fortnight of December she had acute rheumatic pains in several of her joints, with swelling and increased temperature. On the 1st of December the opacities at the periphery of the cornea had assumed the form of striæ, reaching to the central opacity, and a minute blood-vessel could be seen, by means of a lens, to be present in each stria, in some instances running straight towards the centre, in others branching and anastomosing with neighbouring vessels. By December 5 the whole cornea was more or less opaque; the central opacity and striæ, however, remaining well marked and being distinctly *in* the layers of the cornea, as was the vessel in the centre of each opaque stria. The pain and tension increased, and on December 13 there was great cedema of the lids, and chemosis of ocular conjunctiva projecting in folds between the lids. These symptoms were subdued by the Heurteloup, scarifications of the chemosed conjunctiva, and warm fomentations, after which the eyes continued for some time as they were on December 5; sometimes the cornea being a little clearer, and the photophobia and tenderness less marked than at others. On January 6, 1876, the centre of each opacity presented a shallow depression, and looked as if about to perforate, but never did so. This state of things continued till April 25, when she had another attack of cedema, chemosis, and intense tenderness, relieved as before by leeches and fomentations. She was kept in the hospital till the end of May, when the opacities were no less dense, and the striæ with their vessels as well marked as ever, and at her discharge had bare perception of shadows. She returned in the middle of June,

being in the same condition as when she went home, and was again discharged. Re-admitted on the 1st of September; the cornea still presented the same appearances, vision only bare perception of light, tension normal, severe ulceration of alæ of nose and vomer, with psoriasis of palms and soles. She was then transferred to the care of Mr. Hutchinson at the London Hospital, and, just after her admission there, had another attack of œdema and chemosis with such intense pain, that, considering that her vision was almost absolutely nil, excision of the globes was suggested as the best means of relieving her of these attacks; but in the meantime the inflammation subsided, as previously, with leeches and fomentations. The patient still continues under Mr. Hutchinson's care at the London Hospital.

Hour-Glass Cyst of Iris following a Wound.

Under the care of Mr. CRITCHETT.

(See Figs. 1 and 2. Plate I.)

Alfred P., æt. 13, was admitted, July 29, under the care of Mr. Critchett, having been wounded in the left eye with a piece of glass twelve months before. On admission, the spot where he was injured presented, at the lower and outer margin of the cornea, a yellowish, tense, subconjunctival swelling, a little larger than a split pea, reaching to rather above the lower margin of the undilated pupil, obscuring the corresponding portion of the iris, and reaching downwards about $\frac{3}{16}$ of an inch below the corneal margin. This swelling was at first thought to be a dislocated lens, but on examination the lens was found *in situ*, and just inside the margin of the pupil there was found another globular semi-opaque swelling reaching up between the iris and lens to near the centre of the pupil. The two swellings were diagnosed to be cysts, and a communication between them could be seen towards the upper margin of the outer cyst at a point where the iris was deficient. The vision in this eye was $\frac{2}{40}$, and with the hypermetropia of $\frac{1}{40}$ corrected $V = \frac{2}{30}$. On August 4, Mr. Critchett transfixes with a needle the anterior wall of the outer cyst, and excises it with a small piece of the iris which was in it, and both cysts became empty from the escape of their contents, which consisted of a perfectly clear fluid. Six days after the operation a small clear swelling began to appear at the

seat of the original cyst, and gradually increased in size till it became as large as a good sized pin's head; but the inner cyst did not re-form, and the vision was the same as before the operation. The patient was discharged, September 1. On October 14 he returned, complaining of having experienced intense pain during the night before; there was much congestion, and on examination pus was found in the anterior chamber. The swelling with which he had gone out had entirely disappeared, and instead of it was the small linear scar, such as was apparent immediately after the operation, so that it is highly probable that the small cyst had spontaneously ruptured, giving rise to the symptoms which caused the patient to apply for relief. Under treatment by warm fomentations and leeches the hypopyon and congestion disappeared in a few days, and the patient was discharged, on October, 23, with a linear scar, and no re-formation of cyst, the vision being as on first admission in July, $\frac{2}{4} \frac{0}{0}$.

The following is Dr. Brailey's report of his examination of the cyst:—After the operation two fragments of membrane were found to have come away; one nearly colourless, composed microscopically of a thin structureless basement membrane, covered on one of its surfaces by an epithelium made of several layers of colourless cells, and showing on the other surface a little fibrous tissue, the whole probably representing the conjunctiva; the other darkly pigmented and, microscopically, exactly like iris tissue, excepting that on its uveal pigment layer was a thin structureless basement membrane, bearing on its posterior free surface a colourless epithelium of several layers of somewhat flattened cells. Supposing that the first described fragment represents the conjunctiva over the part of the cyst without the globe, and the second, the iris bulged through the sclero-corneal wound with the cyst-wall lining its posterior surface, this case will exactly resemble the one described elsewhere.

Fig. 1.

Fig. 2.

ROYAL
OPH.
H.



Cyst of Iris following a wound.

Fig. 3.

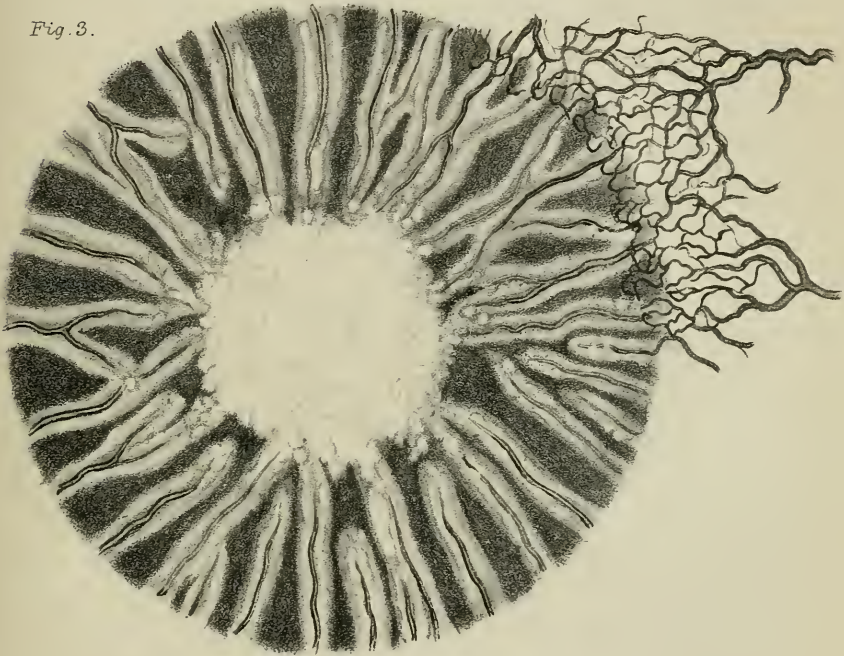


Fig. 4.



Vascular Keratitis in Secondary Acquired Syphilis.

E Burgess del.

W. West & Co. sculp.

CURATOR'S PATHOLOGICAL REPORT.

BY WM. A. BRAILEY, M.D.

No. 14.—*Excision of the Globe containing Cyst of Iris following Extraction of Cataract.*

James B., æt. 67, under care of Mr. Hutchinson; a tall, thin, feeble man, with blue eyes and grey hair; *right* eye excised October 5, 1876; *left* has pupil active, tension normal, anterior chamber shallow, and $V = \frac{1}{5}\%$.

In 1871 his eyes first began to fail; in 1873 cataract was diagnosed. He came here first in July, 1875, when both lenses were hazy, with opacities in all parts. The fundus just visible showed no abnormal change; a linear extraction with iridectomy upwards was done on the right. When seen nine weeks afterwards, the upward coloboma was nearly blocked by a greyish substance extending from above. An iridectomy was attempted downwards and outwards, and a week later detachment of retina was detected. Eleven months later he returned with a large greyish semi-transparent cyst filling the outer half of the chamber of the aqueous. There was ciliary congestion, and deficient tension.

After excision the eye was found to have its full measurements; the cornea was clear. On the nasal side the iris is seen *in situ*, thick and greyish white, its plane inclined rather backwards from its attachment. A large cyst fills the outer half of the aqueous chamber; its front wall has its outer part streaked with dark lines, as if the fibres of the iris were stretched in or over it, and its central and inner part thin and nearly transparent. The cornea was removed, leaving the cyst perfect, where a connection with the short stump of iris left by the last down and outward iridectomy can now be made out.

An equatorial section shows the sclerotic and choroid to be apparently normal, the retina detached, but scarcely at all contracted, a thin straw-coloured fluid between choroid and retina, and an absence of the vitreous.

The vitreous chamber is cut off from the aqueous on the outer side by the posterior cyst wall, extending from the summit of the ciliary processes, and internally by a delicate structureless epithelium-bearing membrane, which can be stripped off without rupturing the cyst, and which appears to represent part of the lens capsule.

The posterior cyst wall thus fully exposed, contains pigment in its external part, and becomes gradually converted into an internal non-pigmented nearly transparent layer, which arches forwards and becomes continuous with the corresponding part of the front wall, thus forming the internal arched summit of the cyst.

Horizontal sections through the external and anterior part of the globe show the cyst and its relations. Here the iris is rather shorter than normal, and is pressed against the posterior corneal surface and the periphery of the aqueous chamber; it has its usual structure, except that behind the uveal pigment layer it is lined by a layer of slightly flattened nucleated colourless cells, arranged several deep like an epithelium; this epithelium also lines the chamber as far backwards as the apices of the ciliary processes, but it can be readily detached from these and from the iris, and is then seen to be borne by an external structureless layer, carrying on its outer surface some globules of uveal pigment epithelium irregularly disposed and adhering to it. As it extends inwards beyond the limit of the iris and ciliary processes, it seems to consist solely of the structureless membrane and its epithelial lining, except behind, where it has also some scattered pigment cells on its exterior, and in front where some of the front nuclear tissue of the iris runs along and ends gradually on its anterior surface; the uveal pigment also runs up a less distance to end by a tapering extremity between the further extending iris tissue and the epithelium of the cyst. At the dome-shaped cyst roof other tissues have ceased and nothing remains but the structureless membrane with its epithelial lining.

No other connection of the cyst than the above-described adhesion to the wall of the posterior aqueous chamber can be detected. The continuation of the pigment of the iris and ciliary processes on its wall, as also of the proper tissue of the iris, may show that it originated by the union of the internal free extremities of these structures, the resulting cavity having been greatly dis-

tended by an accumulation of fluid within it, and acquiring an epithelial lining.

No. 22.—*Sympathetic Ophthalmitis following an old Injury.*

Thomas R., æt. 7. Right eye excised October 14, 1876, by Mr. Wordsworth.

In July, 1876, a boy accidentally wounded his right eye with a nail which projected from a stick. He was at home a fortnight, during the first week of which he suffered great pain. Then he came here and remained in the hospital three weeks. When he went out the wound had healed, but the iris was entangled in it. Four weeks later it became bad again, and the eye looked dull and was much injected. In another week the sight of the left failed a little. At excision, *left* iris thickened, pupil irregular, slightly mobile, posterior synechiæ. Pupillary area of lens filmy. Tension not far from normal. *Right*—transverse wound at the lower and inner part of the cornea, to which the thickened and fibrous iris is adherent. Pupil drawn slightly to wound. Pupillary margin united to capsule of lens, which is here rather opaque; lens quite soft and clear. Ciliary processes opposite seat of wound drawn towards adjacent periphery of lens, to which they seem to be adherent. Here the ciliary muscle is soft, thick, and greyish. A thin greyish layer lines the internal surface of the ciliary processes all round.

The sclerotic is normal. The choroidal stroma is thick, its blood-vessels well developed. Its lining pigment is regular, except just behind the ciliary processes, where it is very dark, and so dispersed as to leave very frequent small circular patches where it is deficient, giving an appearance as if a black ground were punched into holes here.

The *retina* has its rods and cones, and its blood capillaries normal. In these, generally at their bifurcations, scattered groups of colourless corpuscles are collected. On either side of these, rows of red corpuscles, evidently in a condition of stasis, are commonly seen. On the internal retinal surface are a great number of faintly granular colourless bodies of very delicate outline, sometimes round, though generally with a variable number of fine processes; sometimes very long and slender, and ending in a swelling which resembles the original corpuscle. They seem to

be altered vitreous corpuscles. The optic disc is a little swollen, and, together with the surrounding retina, is a little hazy. The yellow spot is decidedly greenish in colour.

The vitreous is slightly greenish in tinge and is more consistent than usual.

No. 769.*—*Wound of Globe followed by commencing Sympathetic Inflammation in the other.*

Lucy R., æt. 38, under care of Mr. Critchett. *Left eye excised July 18, 1876.*

Five weeks ago the left eye was wounded in the upper ciliary region by the patient running against a door latch. She was treated here as an out-patient. Three days before the excision the *right* became irritable and red. She felt a pricking pain in it, and the sight was dim. Now there are found to be two posterior synechiæ. The vision of this eye rapidly improved after the excision. The *left* eye was found to have a bulging at the seat of a healed wound just behind the upper and inner part of the sclero-corneal junction. At this situation there is a coloboma, as if the iris had prolapsed into the original wound. A section shows the iris to project half-way through the scleral wound close to the rim of the aqueous chamber, and to be fixed there. The *lens* is absent. Some soft lens matter is adherent to the iris near the wound. Round the front part of the ciliary processes is a whitish ring of lymph, and another along their posterior margin. A mass of vascular lymph continuous with this anterior ring fills up the coloboma of the iris.

The *cornea* is quite clear and the *iris* not much altered. The *sclerotic* is normal. The choroid is rather œdematous near the optic disc. This is swollen, and a whitish retinal opacity radiates from it for some distance, probably from retinal œdema.

No. 714.—*Punctured Wound in Sclero-corneal Junction involving the Ciliary Body, but escaping the Lens.*

Agnes A., æt. 6. Right eye excised by Mr. Hulke, April 26, 1876.

* The high numbers are in continuation of the cases in former Reports. The low numbers begin a new series.

Six days ago a drill wounded the right eye; immediate total loss of sight followed, with severe pain which has continued ever since. The globe presents a still unclosed penetrating wound at the upper part of the sclero-corneal junction. Behind this the peripheral margin of the iris is detached for a short distance. The wound has escaped the periphery of the lens, but has extended to the ciliary processes; for near their internal surface an eyelash is found in them, and in a clot of blood and lymph on their inner free surface another is found embedded. Just behind this the choroid and retina are slightly detached from the sclerotic. The *retina* is a little whitish and opaque all over; its yellow spot is dark. The optic *disc* is a little swollen. The *lens* is *in situ*, and quite clear. The *iris* is thick and greyish, and from its detached margin a blood clot extends over it, and hides the pupil. The *vitreous* is yellowish and detaches readily from the posterior half of the globe; near this surface it contains within it streaks of blood clot. *Left* has its pupil large and almost motionless.

No. 732.—*Microscopical Examination of an Increasing Corneal Opacity of peculiar character.*

Allan M., æt. 47, married, barman; operated on by Mr. Bowman, May 30, 1876.

A dark complexioned man, rather abstemious, and enjoying good health. When æt. 21, had what seems to have been a soft sore followed by a bubo, but by apparently no secondary symptoms. He has varicose veins in his legs.

The surgeon under whose care he was before he came here says that seven months ago the patient came to him with a small vascular point looking like a phlyctenula within the upper corneal margin. This got nearly well under tonics, the patient's health being very feeble at the time. Then he lost sight of him, and when he saw him again, one month or so afterwards, that part of the cornea showed a little way below its surface a white opaque area, but no loss of substance. On March 3, he came here with a large excoriated, softened, and vascular surface at the upper third of the cornea, but no granulations on the conjunctiva. On the 21st iridectomy downwards was done, together with a peritomy of the conjunctiva round the upper corneal margin. On

May 23 he came here with the opacity occupying rather more than the upper corneal third. The surface is smooth and there is no loss of tissue, and beneath it the opacity which appears to be in the cornea proper, is very white like a leucoma, and its convex lower border is similarly very white, with a very faint tinge of yellow. There are blood vessels on the opaque part, and it is larger than before the last operation. Mr. Bowman pared off the superficial piece of the cornea, apparently taking away most of the opacity; and on May 30 the cornea corresponding to the excised part looked semi-opaque, like half-coagulated albumen, and blood-vessels ran into it from above. On July 4 the opacity is said to be diminishing, but in the corneal area corresponding to the artificial pupil, there is a similar smaller opacity in which there is a dark streak, probably a blood vessel. Sections through the excised piece show, surrounding the diseased tissue, a nearly healthy margin where the epithelium and the superficial corneal lamellæ are normal, but the nuclei of the deeper lamellar fibres are multiplied, and are small, round, or elongated in shape, and irregularly disposed. Where the diseased part begins the epithelium varies much in thickness, and sometimes isolated bits are thicker and project out like papillæ, while the intervening epithelium is thin. Beneath this the anterior elastic lamina is normal, but the nuclei of the superficial proper corneal tissue are much multiplied, so as almost to conceal any other structure; more deeply very rare and feebly stained nuclei alone are seen, the tissue between which presents nothing of a lamellar or even fibrous structure, but seems rather molecular, as if fatty, though nothing like distinct oil globules can be seen.

It would seem as if the proper tissue of the cornea underwent some low form of inflammation with an increase of nuclei, and that afterwards a form of molecular degeneration occurred.

735.—*Cataract Extraction followed after six weeks by Sympathetic Irritation (? Iritis) of the other Eye. Excision and Examination of the Irritating Globe.*

George S., æt. 62, agricultural labourer, under care of Mr. Bowman, who excised the left eye, June 2, 1876.

For five years he has worn spectacles for reading, and two years ago he noticed that the vision of both eyes, especially the

left, was a little dull. The dullness, which was not accompanied with pain, continued to increase, and fourteen weeks before excision he went to a country hospital and was tested as to his vision. With the *left* he appears to have had $V = \frac{20}{200}$ according to his account, but he certainly could distinguish a small bottle in the surgeon's hand. On the next day the lens of the *left* was extracted, probably by an incision just within the cornea and without an iridectomy. On the second night he was feverish and restless and got the bandage off, and the eye was slightly inflamed. On the third day he was shown a glimpse of light, but then and since there has been slight inflammation and the eye has been a little painful at times. All perception of light gradually faded away from the left eye, and after he had been in the hospital six weeks slight inflammation came on in the *right*, and nine days ago this was accompanied with slight pain.

He remained in the country hospital eight weeks in all. On admission here, *June 1*, 1876, the *right* presented a rather contracted sluggish pupil, some ciliary injection and much lachrymation and photophobia. *June 2*, iridectomy upwards was done on the *right*, and the *left* was excised. Next day the anterior chamber was restored, the pupil dilated and there was a good coloboma. After this the eye gradually improved much, though six weeks later there was a small ulcer on the lower part of the cornea.

In the excised eye the globe was rather shrunken, the anterior chamber extremely small, the iris thickened with greyish lymph on its front surface which also blocks the pupil. At the upper and inner part of the eye there is a drawing in or indentation principally of the sclerotic, mostly behind, although it involves the scar of the operation wound, which is corneal and lies close in front of the sclero-corneal junction. An antero-posterior vertical section shows the retina to be contracting into an umbrella shape, still of course retaining its attachment to the optic disc and the ora serrata, and surrounded by a yellowish turbid fluid. The cornea is much thickened at and near the scar and to this the iris is closely adherent.

The sclerotic is thick near the scar but thin in the ciliary region opposite, and here the ciliary processes seem to be forcibly drawn in to the axis of the eyeball, probably by the contracting retina, so that the ciliary body has its tissue much stretched out.

The same thing occurs to a less degree behind the scar. The much stretched ciliary body seems to be infiltrated with an albuminous fluid.

Nov. 8, 1876.—Writes that his right eye is free from inflammation and pain, but that the sight becomes more dim.

767.—*Double Cataract Extraction, with an interval of Ten Days between the Operations—Iritis of the Second Eye (the Left) followed by failure of the other (probably Sympathetic Iritis)—Excision and Examination of the Left Eye.*

Sarah J., æt. 59, married; under care of Mr. Hutchinson. Left eye excised July 17, 1876. Globe a little diminished in vertical diameter and of rather deficient weight. Cornea clear. Artificial coloboma upwards, blocked by opaque whitish lymph.

Retina and choroid in situ. From the much swollen optic disc there runs forwards a delicate tubular membrane made of very indistinct fibres, which then expands into an umbrella-shaped termination and finally ends on the posterior border of the ciliary processes. Round this terminal part is the greenish glassy globe representing the remains of the vitreous; the posterior part, equal to two-thirds of the vitreous chamber, being filled with yellowish serum.

In 1870, she came here with considerable opacity of the right lens and striæ in the left. Pupils very sluggish and of medium size. *Right* counts fingers. *Left* $V = \frac{20}{100}$, and with $+\frac{1}{7}$, reads J. 2. Both failing one year.

In April, 1876, right lens was extracted; linear operation. The eye did well, and ten days later the left was also extracted. After this operation there was severe iritis, and the pupil became blocked with vascular lymph. No anterior chamber. Tension normal. Perception of light only. At the end of seven weeks she left the hospital still in this condition, and returned four weeks later with the *left* painful at times and very irritable, but still good p.l. *Right* with $+\frac{1}{2}$ reads J. 16 and $+\frac{1}{3} \frac{20}{100}$. The sight is decidedly failing. There are dotted deposits on the posterior corneal surface and also opaque remains of capsule.

The failure of the *right* was thought to be due to sympathetic mischief and the *left* was therefore excised. Its subsequent examination is reported above.

Oct. 31, 1876.—Perception of light still remains in the right, with occasional shooting pain. In other respects it remains in the same condition as above reported.

No. 738.—*Enucleation of an Eye on the fourteenth day after Sclerotomy had been performed for old Glaucoma.*

Charlotte S., æt. 55. Right eye excised June 5, 1876, by Mr. Streatfeild.

Five years ago, pain and inflammation suddenly attacked the right eye, the cheek-bone, ear, occiput, and all this side of the head being involved in the pain. The sight, which had been failing a little for twelve months, now faded very quickly, and at the end of a month, though the pain had much abated, there was no perception of light. During the next month or two, there was a little occasional pain, and since then it has disappeared, except on very rare occasions, when there seems to be a slight cold in the eye. She had worn glasses to read with for two years before the first trouble. About seven months ago, she noticed coloured rings round a light with the left eye, and a month later the eye had an attack exactly similar to the outbreak in the other. This pain has lasted, off and on, ever since, and when it is severe the slight inflammatory attacks in the other eye are worse. The sight in this eye also rapidly failed.

On May 24, there was absolute glaucoma in both eyes. *Right* had $T = + 3$; no p. l. *Left*, $T = + 2$; p. l.

On May 25, iridectomy upwards on the *left*; sclerotomy upwards on the *right*.

Next day, the lens escaped from the *right* at the orifice of entrance of the knife.

29. *Right* painful; $T = + 1$. *Left*, pain much relieved. T.n.

June 1. *Right* very painful. Large staphyloma of incision.

June 4. Great pain in *right*. Eye bled last night. Chemosis to-day.

On the 5th, Mr Streatfeild excised the right eye. *Left* has no pain, and can see a hand move at four feet.

Sections through the sclerotomy wound at right angles to its plane show that the sclero-corneal junction has not been divided through its entire thickness, so that a superficial layer, consisting

of conjunctival epithelium, episcleral tissue and proper corneal tissue, is left uncut. The deeper divided part of the sclerotic tends to separate from the superficial uncut part, and to curve slightly inwards towards the centre of the globe, the two being separated by a layer of effused blood. The ciliary muscle and remains of iris apparently retain their attachment at the ciliary ligament, but behind this the ciliary processes and their continuation, the choroid, are bulged forwards by a large accumulation of blood, which fills the globe, and bellies them out like a sail, so that the internal surface of the choroid lies covered by the softened retina close to the posterior corneal surface. A second deeper row of pigment rises from the ciliary ligament, and, lying at first close to the curved portion of sclerotic as far as its anterior cut termination, then ends in a little irregular iris tissue, which is involved in the gap of the sclerotomy wound. In this neighbourhood, too, are found structureless fragments of membrane, probably the remains of the lens capsule.

766.—*Excision of Shrunken Globe.* A condition somewhat similar, though probably in an earlier stage, presented by the other. No history of any illness.

Laura S., æt. 9 mo., a fairly healthy-looking, well nourished child, with fair hair and blue irides, under care of Mr. Hutchinson. Left eye excised July 17, 1876.

Six months ago, there was noticed by the friends a white reflex, with blood-vessels on it, from the back of the left globe. Three months later, this eye was much inflamed, and remained so till the excision. A month ago, they noticed in certain lights a similar white reflection, though not bearing blood-vessels, in the right eye, but without inflammation. They then brought the child here, when the left cornea was found to be hazy and vascular. There was vascular lymph behind the pupil. The eye was shrinking. Tension probably minus.

Right eye presented a reflex from its fundus resembling glioma. Tension about normal.

At excision of the Left; its cornea is very small and very prominent. A deep brownish colour is behind it, apparently from blood in anterior chamber. Tension a little minus.

The right shows a white vascular reflex from fundus exactly like glioma. On its nasal side there is apparently perception of light.

The left excised. After excision, the left globe was a little squared. The *sclerotic* very thick behind; *choroid in situ*, pale brown. Inside this, a thick broad column extends from optic disc, and from a pointed attachment on its outer side to the back of the lens capsule. This is in the situation of the retina, but its exterior part appears to be made of a pinkish layer of organised lymph, with under it a coal-black pigment layer. Inside this is a greyish fibrous tissue, with two or three dark pigment streaks parallel to the other in it. Within all is a tough bluish white fibrous material, representing the remains of the vitreous. The outer pink layer seems to be fibrous, and the black pigment layers may be altered blood pigment from old hæmorrhages in or on the retina, which had its position somewhere in this tissue.

The anterior chamber is very deep, and full of blood. The pupil is quite closed by a thick layer of lymph, which extends all over the front of the iris. The lens is globular and opaque, and situated with its front surface quite behind the corneal border.

The choroidal stroma is of a whitish colour, bearing on its internal surface a light brown easily detached layer, made up of columnar cells much like an epithelium. These are $\frac{1}{1300}$ -inch long, rounded at their attached end, near which they are slightly constricted. Their free ends are abruptly truncated. Fine brown pigment granules are collected rather towards this end of the cell. All the choroidal elements are present. The blood-vessels are few, and the branching cells of the stroma few, and but very slightly pigmented.

Arguing from this examination of the left eye, it would be inferred that the right is not a glioma.

Oct. 31. The child is well and strong; the right eye neither inflamed nor swollen. At times the father thinks there may be perception of light in it.

678.—*Retinal Glioma recurring after Excision of the Globe.*

Annie A., æt. 2. Right eye excised by Mr. Hulke, February 27, 1876.

A well-nourished very healthy-looking child, with brown hair

and grey irides. Six months ago the pupil of the right eye was observed to be larger than its fellow, but as the child did not seem to suffer, no further notice was taken of it then. *At excision*, Tension = + 2. Pupil widely dilated; ciliary veins enlarged; no p. l.

A longitudinal section of the globe shows a rounded tumour to project from the optic disc and fill nearly half the cavity of the globe. The disc is deeply cupped, its concavity being filled by tumour cells which depress the adjacent part of the lamina cribrosa, and extend also as a small conical plug, in or round a blood-vessel, for a short distance in the centre of the optic nerve. The choroid is *in situ*, but near the disc it is thickened by an extension of the tumour mass into it.

The ciliary retina extends forwards from near the surface of the tumour, and looks about normal; the lens and other media are clear. *On section*, the tumour is reddish, containing in front numerous hæmorrhages, and in its posterior part many calcareous particles. Microscopically, it is made of round or oval nuclei, which stain well, and which are surrounded by a thin scarcely staining periphery. In them can be usually seen one or two darker points, and a few indistinct granules. The appearance of more deeply stained areas round sections of blood-vessels with intervening less stained tissue, as in Case 645 (p. 69), cannot be made out, though about the centre of the tumour there is a less stained region made up of a few stained cells mixed with many times their number of cells scarcely stained and with faint outlines. The retina in front seems unaffected by the tumour, but its nervous layers are atrophied, and its granules form but a single layer. The deeper fibres of the lamina cribrosa present numerous well stained nuclei, as also the fibrous tissue within the optic nerve, and that forming its sheath, but between this and the nerve there is a large accumulation of cells exactly like those of the glioma.

The choroid near the disc is thickened with cells which conceal the blood-vessels and replace all its tissues except the lamina fusca, which appears to be unchanged. At a short distance from the disc the tumour cells cease rather abruptly, only extending a little further as rows of 3 or 4 cells, which give the notion that one has multiplied into several by longitudinal fission. For a little way now the choroid is free, but soon cells again appear between the vitreous lamina and the pigment epithelium; a little

further on both are again absent, and the cells extend from the overlying tumour between and around the blood-vessels of the choroid; soon the continuity becomes more marked, there being nothing but cells seen in the choroid though they appear to have something of a linear arrangement, probably from the arrangement of the remains of its stroma.

All the tumour cells found in the choroid stain well; in the ciliary muscle and the iris are crowded, numerous, small, round, or elongated well staining nuclei. The anterior elastic lamina of the cornea is not seen, and the columnar shaped cells of the deepest epithelial layer are not all disposed at the same level, some giving the idea as if entering the epithelium from the proper corneal tissue, and this is strengthened by many of the corneal nuclei, which are more numerous here, being arranged with their long axes at right angles to the corneal surface and appearing as if about to enter the epithelial layer; here are also found a few small blood-vessels. The rest of the proper corneal tissue with the posterior elastic lamina and its epithelium is normal.

In March it was reported that there was no return, the child being quite well.

In May the growth recurred and projected as a large mass from the orbit.

August 20.—The sight of the other eye is now entirely lost, probably by a retinal glioma.

September 4.—During the last day or two she has had several slight convulsions, and to-day she died. The tumour is described as appearing to be about the size of a common penny stone ink-bottle.

No. 655.—*Examination of an Eye, a portion only of whose Retina is implicated in a Gliomatous Swelling.*

Ernest L., æt. $2\frac{1}{4}$. Left eye excised by Mr. Bowman, January 7, 1876. A very healthy-looking, active, and tolerably forward child.

Ten weeks before excision he fell from a chair and struck his left eye against the fender, much ecchymosis round the eye followed, but the conjunctiva was but very little involved in it. A transverse scar a little above the outer canthus remained after the accident. About a fortnight later the area of the pupil was

noticed to be whitish, and on November 30 the child was brought to this hospital, and glioma was diagnosed; soon afterwards he frequently rubbed the eye, as if from pain. On January 7, they brought him here again, and a white woolly swelling was noticed bulging into the vitreous, on the lower and inner side of the optic disc, hiding this and projecting forwards nearly as far as the clear lens, and extending upwards and outwards so as nearly to touch the retina of this part. Floating shreds are seen on its surface through the clear media. The pupil is rather small and sluggish.

On opening the globe by a section passing through the centre of the tumour and the disc, its edge is seen to be 3 mm. from the optic disc, and the retina between the two is thickened and runs directly forwards, but not in contact with its choroid, so as to end in the centre of the tumour, from the corresponding part of the opposite side of which it again emerges, and then runs normally forwards as far as the ora serrata.

The retinal layer of the upper and outer part of the eye is normal in its position and relations, but close to the optic disc it is a trifle thickened. Microscopically this is due to a slight thickening of the granule layers, they being densely packed, and also by a pointed extension of close staining nuclear bodies from the optic nerve into the nerve-cell layer for a very short distance, and by a similar though broader and less dense extension into the nerve-fibre layer. These thickenings seem to go on *pari passu*, and at their termination the retina continues with its structure about normal.

The short thick layer running to the tumour is made up of closely arranged staining bodies like granules or glioma cells, containing near their exterior numerous blood-vessels. Just before it enters the tumour it is bent on itself in such a way that it is impossible to say whether its inner or outer part is in special relation to the tumour. There seem to be some indications that in this part of the retina the granule layers may not be so much thickened with the staining bodies as are the nervous layers, though they contain far more numerous blood-vessels.

In the tumour itself no distinction of retinal layers can be made out, but we have circular deeply-stained areas each with a central transversely cut thin-walled blood-vessel, or elongated areas made up of two parallel deeply stained columns with the blood-vessel between them cut longitudinally. Between these

are areas of much more feebly-stained cells without blood-vessels, and others again which seem simply finely granular and scarcely stained, but contain a few ill-defined stained glioma-like bodies.

Longitudinal sections of the optic nerve show it to contain rows of large well stained bodies like nuclei principally between its nerve-bundles; and also a few among them running forwards in rows to be continuous with those found among the nerve-fibres. The retina between the tumour and the ora serrata has its nerve-fibre layer atrophied, so that Müller's fibres are extremely well seen, and near the tumour its granule layers thickened. Here also the distal ends of the rods are swollen into fatty-looking knobs which in other places are detached as a fringe of globes. The choroid is normal in structure throughout.

Nov. 9, 1876.—The child is reported as being free from any sign of the return of the tumour.

No. 645.—*Glioma of Retina.*

The Lateral Half of the Eye of an Infant, æt. 2 Months.

Presented by Mr. Lawson.

The sclerotic, choroid and lens are *in situ*, and to the naked eye unaffected. The growth extends from the optic disc filling up the entire cavity of the globe. Its central part contains numerous white calcareous-looking particles. No traces of retina can be made out in this view, but on cutting through the half transversely there is seen for a short distance between the choroid and the tumour a much-folded layer looking like retina and terminating at each end apparently in the tumour mass, which, though free from it at intermediate points, occupies its entire inner surface and extends beyond it at each end.

This retinal layer, is very many times bent so suddenly and acutely that it is not plain which of its surfaces becomes continuous with the tumour, but the external seems to be the more likely one. At the convexities of the sharp bends the outer granules occupy increased space, but it is a question whether they are here much more numerous. The same applies to the inner granules, which are disposed in a precisely similar manner. The nervous layers are not involved in the folding, but run straight on. They present a greatly increased number of large

staining nuclei, these resembling much the granules and being also scarcely distinguishable from the glioma cells.

The rods and cones are short, their distal ends are swollen into colourless slightly granular globes which readily become detached. Close to the tumour these become less distinct and only a whitish granular fringe remains.

The tumour itself consists of roundish cells about $\frac{1}{3200}$ -inch in diameter, with one end generally drawn out into a short spike or process. The body, with the exception of a narrow circumferential rim and the spike, stains well. These cells are slightly granular, but present no distinct nuclei or nucleoli. The mass is extremely friable, but sections of it can be made with difficulty and they show many circular areas of deeply-stained cells, each with a central circular aperture which was probably occupied by a thin-walled blood-vessel. These areas are separated from each other by an intervening substance, the cells of which stain much less and of a somewhat different tint. Other sections appear to show the vessels cut through longitudinally instead of transversely, and here the same arrangement prevails, only we have two parallel longitudinal columns of well stained tissue with the thin-walled blood-vessel between them and surrounding all, less stained tissue.

Cross sections of the optic nerve show stained bodies having much the appearance of the glioma cells lying between and among the nerve-bundles and even lining the cavities of the central artery and veins. These appear to replace the ordinary nuclei of the fibrous tissue. The ciliary muscle and pars ciliaris retinae are unchanged. The central part of the lens is granular and does not exhibit the usual fibrous structure, while the fibres of the periphery show well-marked nuclei.

The other eye, also gliomatous and painful besides, was soon afterwards removed. The patient died away from the hospital before there was any return of the primary tumour.

Examination of a Glioma of the Retina.

Specimen presented by Dr. Bell Taylor of Nottingham.

The pupil is dilated, and the anterior chamber very shallow. An equatorial section shows the sclerotic to be rather thin. The choroid is *in situ*. The retina is folded abruptly in from the ora serrata nearly to the centre of the posterior capsule of the

brownish rather flattened lens. Near the ora serrata it is about its usual thickness, then it gets thickened gradually, and from the back of the lens it extends back as a column, whose surface is marked with deep sinuous folds, to the optic disc. This column has a central canal containing the remains of the vitreous and occupies about one-fifth of the cavity of the globe. The other four-fifths outside this is filled with serous fluid. It appears as if the retina were detached into an umbrella shape, and as if a thickening of it had begun a little way from the ora serrata and extended back all the way to the disc.

Microscopical examinations of the column of thickened detached retina between the optic disc and the back of the lens capsule show it to be very brittle and to be made up of bodies from $\frac{1}{1500}$ to $\frac{1}{2500}$ inch in diameter, which are generally round or oval in shape and faintly granular. Their central part stains fairly well, but they are surrounded by a very narrow margin which scarcely stains and which is drawn out abruptly at one or both ends into a short fine fibre. In the mass are numerous sections of very thin-walled blood-vessels. And the cells of the areas round these are well stained by logwood, while remote from them the staining is very slight. On cutting antero-posterior sections of the anterior part of the retina into which the thickening appeared to the naked eye to be only just extending, it was seen to consist of two layers of granules apparently not multiplied; outside them a few short colourless rods, with frequently knob-like ends, the representatives of the rods and cones; and inside them a few stained oval nuclei and a fibrous layer indistinctly longitudinal. As the retina approaches the tumour the inner granules seemed multiplied and occupied a greater area, sometimes blending with the outer granules, from which globule-like prominences of bodies similar to these projected on to the rod and cone surface, these being here deficient. Still nearer the tumour the multiplication of the inner granules is much greater; but they leave the outer granule layer unaffected and reach up to the internal limiting membrane through which they perforate, running along the internal retinal surface as a layer of cells many deep near the perforation, but finally tapering as it extends along the retinal surface till it ends as a layer only a single cell thick at its free extending edge. The cells of the tumour mass generally approach to round in shape. The somewhat multiplied nuclei of the internal retinal layers near

to but not actually involved in the tumour are generally oval or rather elongated.

Transverse sections of the optic nerve show many round stained nuclei between the nerve-bundles, much more numerous than normal, and some within the bundles. When the sections are teased out the nuclei are found to be scarcely separable from the fibrous tissue, but some can be isolated either singly or in groups of two or three. They stain throughout, otherwise they bear a general resemblance to the glioma cells.

No. 631.—*Examination of a Globe containing a Sarcoma of the Choroid—Recurrence of the Tumour in the Optic Nerve Stump.*

Jacob C., æt. 48. Right eye excised by Mr. Critchett, August 17, 1875.

At excision, tension increased. Pupil widely dilated. Anterior chamber deep. Retina detached, except in front and at optic disc. The tumour starts from the edge of the disc by a pointed process which runs along the lower and inner part of the globe, getting wider and ending by a broad termination nearly as far forwards as and parallel to the ciliary processes. Microscopical sections of the choroid distant from the tumour show it to be normal, but close to it there is an increase of staining nuclei in the inner part of the choroid, especially round the cut sections of the blood-vessels, in proportion to the pigmented stroma cells. Further on, a thick, bluntly wedge-shaped mass of tumour cells extends from the tumour into this unaffected choroid, replacing entirely, except for a few scattered stroma cells and pigment granules near the sclerotic, the deeper half of the choroidal tissue. The superficial part of the choroid runs along the surface of this for a little distance as a diminishing and soon disappearing layer. The tumour is made, near this wedge-shaped edge, of bodies larger but of less distinct outline than the choroidal nuclei; their central part stains deeply, while a very narrow and indistinct peripheral zone scarcely stains at all. Sometimes this zone is larger, and embraces within it several nuclei, as if a larger cell had its nucleus divided into several. Among the deepest tumour tissue, and where this penetrates between the adjacent scleral fibres, the arrangement of the tumour cells appears to be

mostly linear. At two points near the centre of the tumour are areas of less stained tissue, having but a few stained cells, of which most are fusiform, scattered through a colourless, very faintly fibrous substance, which also contains many round bodies rather larger than tumour cells, having small, very faintly stained nuclei, and an aggregation of minute brownish granules on their surfaces. These may be degenerated tumour cells, with some blood pigment.

The tumour encroaches a little upon the optic disc, so as to push the retinal layers to one side. No special tumour cells can be found in the optic nerve, but the nuclei of the lamina cribrosa, and those between and among the nerve-fibre bundles, are round, deeply staining, and more numerous than normal. Close to the cut end of the nerve they are only moderately increased in number. The surface of the tumour is dark-grey in colour, though microscopically it exhibits but little pigment.

On April 28, 1876, the patient returned with a large mass filling the right orbit, and pushing the lids forward. He says that six weeks ago slight discharge, swelling, and pain came on, and have increased ever since. This growth was entirely removed by Mr. Critchett, its only connection, other than areolar, being to the stump of the optic nerve at the apex of the orbit. It is generally oval in shape, with an antero-posterior diameter of 18 lines, lateral 12, and vertical 16 lines. It is firm. Its front is marked into two lobes by a slight transverse depression.

The optic nerve is seen running along its inner and upper part for three lines; it then curves suddenly into the tumour, and lies about three lines below its upper surface. To the naked eye, its section appears simply fibrous and atrophied, but under the microscope a large number of staining nuclei, nearly as large as the tumour cells, and containing deeply stained point-like nucleoli, are seen between and within the atrophied nerve-bundles. Within the tumour, the fibrous nerve-sheath remains, but the area of section of the nerve soon becomes larger, and filled with dirty yellowish-white crumbly contents. These are made up of cells of faint outline, sometimes slightly granular, with occasionally a very faintly-staining, dot-like nucleus.

In front of the termination of the nerve, the tumour is blackish, with faint pigment mottlings, and in front of this again is a white fibrous-looking central part, and then the greyish anterior

part of the tumour. Behind the nerve there is a narrow zone, pinkish, as if from capillary hæmorrhage, and then again a peripheral greyish part. Scattered through the most internal part of the greyish periphery are spots looking like the yellowish crumbly contents of the optic nerve, and having the same microscopical structure.

The white central region is made up of fibres arranged parallel to each other, sending out small branches obliquely to unite with adjacent fibres, and containing between them large round cells, with deeply staining dot-like nucleoli. The peripheral part has a similar structure, but its cells stain better, and they are more abundant in proportion to the fibrous tissue. The dark mottled portion and the pink zone are similar, but the cells and nuclei stain less, and the fibrous tissue is more abundant, and among the fibres and cells are seen globes of various sizes, from half to double the size of the tumour cells, which are granular, from brown pigment deposits, and which may be either cells or simply agglomerations of pigment granules.

In fact it seems as if almost within the limits of one microscopical specimen many varieties of structure occur; in one place, cells which stain well and have but very little intervening fibrous tissue; near this, larger cells with staining dot-like nuclei in the interstices of large branching fibres; elsewhere close fibrous tissue, with either a few nucleated cells in it or pigment globes of various sizes; or simply degenerating cells of faint outline, with scarcely a staining point in one of them, such as are the crumbly contents of the optic nerve near its termination, and the soft yellow spots described in the tumour.

No. 687.—*Carcinoma involving the Superficial Layers of part of the Cornea Proper and adjacent Sclerotic of a Horse—No return of the Growth two months after Excision of the Eye.*

Specimen presented by Dr. Bell Taylor, of Nottingham. The patient is a cream-coloured horse, aged 8 years. The growth began in the sclero corneal junction, and gradually extended, till now it implicates five-sixths of the cornea, and extends 8 mm. into the adjacent sclerotic. Its central part is above the general corneal level and looks papillomatous, while its periphery is overlapped by healthy corneal tissue. The conjunctival

epithelium upon this, at first normal, then runs on as a thin patchy layer, and finally comes to an end before the superficial healthy corneal layers cease. Sections show that the superficial one-third of the cornea separates from the deeper layers which remain healthy, and that the gap so formed is filled by fibrous bands crowded with rounded nuclei, and containing alveolar spaces in their interstices. These bands appear to be prolongations of the proper corneal lamellar tissue, and the alveolæ formed by them are filled with cells, many of which, however, have dropped out in the sections. These cells increase in size from the periphery to the centre of each group; the outermost are not much larger than the neighbouring corneal nuclei, being about $\frac{1}{2500}$ -inch diameter, while the central ones are $\frac{1}{1000}$ -inch diameter or even larger. All have well stained nuclei surrounded by a wide margin of less stained formed material, and they have a general resemblance to the cells of the deeper layers of the conjunctival epithelium, but they are for the most part considerably larger than these. In the sclerotic and sclero-corneal junction the structure of the tumour is the same, and though a perforation to the interior of the globe, or some connection with the ciliary body or processes, was specially looked for, none was found.

Two months later the horse exhibited no symptom of tumour anywhere, was in capital health, and was reported as having just been the winner of a steeplechase.

No. 789.—*Cyst of Iris—No History of any Injury.*

Arthur B., æt. 14, gardener's boy, fair-haired and well-nourished, with blue irides. Admitted June 16, 1876. Under care of Mr. Wordsworth.

Six weeks ago slight conjunctival injection, together with a "speck" behind the lower part of the cornea, first appeared. The speck got noticeably larger in three weeks, and for the week before admission he had a little aching pain in the eye which was the cause of his applying at this hospital. Reads 1 J., and with $-\frac{1}{50}$, V = $\frac{20}{20}$. The other eye is quite unaffected.

A cyst extends from the lower part of the anterior chamber nearly up to the margin of the ordinary sized pupil. The lower part of its posterior wall is formed by the deeper iris tissue, and appears black, though by oblique illumination it has a reddish

tinge, as if from great vascularity; the remainder, including the front wall and dome-shaped roof, is quite thin and transparent, and appears to be the superficial iris tissue. Mr. Wordsworth made with two needles a rent in the thin anterior wall, when the cyst collapsed almost entirely. In this condition it was when the patient left the hospital two weeks later.

Three months later things were just the same, the cyst wall, though still visible, remaining undistended. The injection has entirely disappeared, and there is no pain.

Two drawings of this case are preserved in the Museum of the Hospital.

No. 679.—*Examination of a Globe which presented some features of Myopia.*

Mary B., æt. 57, spinster. Left eye excised by Mr. Critchett, February 29, 1876. A flabby looking woman, with light-reddish hair, and bluish-grey irides. A few days before excision she struck her toe against a stone, and fell with her left eye against an iron railing. Four days afterwards she came here, and was treated with belladonna fomentations; then much pain in the eye came on, and the other became weak and its sight a little dim. Now the *right* reads 3 J. at 12". Unfortunately it was not fully tested; its pupil is very small; there is a slight central corneal nebula. She never, she says, noticed any special deficiency of sight in either eye. The *left* has bare p. l. $T = -2$; globe ruptured along inner and lower half of sclero-corneal junction. The iris behind this is detached all round this part of its periphery, and is prolapsed into the wound, elsewhere it is thick and dull, but is free from adhesions. The cornea is slightly hazy at its centre; the lens substance is soft and glue-like, and very small in quantity. The globe is large, especially from before to behind, and has much the appearance of a myopic eye. An equatorial section shows the posterior part of the vitreous to be fluid, and pale yellow in colour; its anterior part is firmer, and contains hæmorrhages close to the ciliary processes behind the seat of wound. The choroid and retina are *in situ*. The optic disc is a little swollen, and its vessels a little diminished; it presents a shallow depression towards its outer part, the bottom of which is about level with the general retinal surface, while the margins of the disc are a

little raised above this. Surrounding the disc is a circular white area, like a posterior staphyloma, rather more extended on each side of its lower part, but more especially outwards. Occupying the region of the yellow spot is a white atrophic area, about one-sixth inch in diameter, presenting on its surface a few black streaks; this nearly reaches up to the margin of the white area round the disc, and it presents beyond its outer border two similar smaller patches, and below them a small dark-grey spot. The whole choroid is of a pale yellow-red colour. Just behind the ciliary processes are some small black superficial-looking spots.

Microscopically, the projecting margin of the optic disc is made of loosely arranged fibres containing round well-stained nuclei. In the nerve the nuclei are large and well-stained, and arranged principally in rows between the nerve-bundles; others follow in rows the course of the fibres of the lamina cribrosa. In the tissue of the sheath of the nerve also the nuclei are well seen; indeed, in this specimen, they are as prominent in the nerve on section as in Case 678 (p. 65).

Close to the disc there is but a single granule layer in the retina, and the rods and cones, with the pigment epithelium and vitreous lamina of the choroid, are wanting, while the choroid is extremely thin, and the branching brown pigmented cells of its stroma are very rare.—Nearer the margin of this white area a second thin layer of granules appears, and beyond this some short and thick bodies representing the rods and cones, whose distal ends are swollen into colourless globes which frequently lie separate. Just before these rods and cones begin, a very thin layer of cells with faintly stained nuclei, and very faintly pigmented bodies, represents the pigment epithelium. This soon becomes thicker, and then, while it in one place seems normal, in another it is either wanting altogether or extremely thick and darkly pigmented; only where it is normal are the rods and cones and outer granules seen. The other retinal layers are about normal, except that the internal limiting membrane is very much wrinkled, while the choroidal stroma presents the same characters as close to the disc.—Sections through the white patch about the yellow spot show no precise distinction between retina and choroid. There is an outer thin stratum of elongated, frequently spindle-shaped, fibres parallel to those of the sclerotic, and containing round or oblong stained nuclei, but

no pigment; these probably represent the choroidal stroma. Within this there is a thicker layer of more numerous, round, stained bodies, embedded in an indistinctly fibrous matrix, probably representing the tissue between the pigment epithelium, and outer choroidal stroma. Then most internally is a more open fibrous layer with round or oblong nuclei, this probably representing the retinal framework with the remains of its different layers. No sections of the edges of this patch can be found to show the precise continuity of these with the normal retinal and choroidal tissues, but those already described from near the disc show the retina and choroid much simplified by the loss of their pigment, rods and cones, and outer granules.

It is interesting to notice the similarity of microscopical structure between this case near the optic disc, and Case 609 (Vol. viii, p. 552), which has been described as one of choroditis disseminata.

No. 4.—*Swollen Optic Disc following recent Wound.*

Richard W., æt. 4. Right eye excised by Mr. Wordsworth, September 20, 1876. Four days ago he fell with a knife in his hand and cut across the cornea, through the lower lid, at the junction of the upper and outer third with the rest, the incision extending $\frac{1}{4}$ -inch backwards into the sclerotic at each end. The *lens* is soft. The *retina* and *choroid in situ*. The *optic disc* swollen, and there is a whitish haze over and around it. Its arteries are rather small and its veins a little enlarged outside the disc, though on it they are even rather small. At one point in the retina, near the disc, is a fine brush-like capillary hæmorrhage, Microscopical sections show the optic disc to be decidedly swollen, and the swelling is chiefly behind the deep retinal surface, so that the retina is, as it were, lifted up away from the scleral nerve entrance, with which it remains connected by the fibres as a thick pedicle. The retina contains all its layers. The choroidal stroma is probably œdematous, containing numerous dilated blood-vessels. It also contains round the walls, and scattered through it, numerous nuclei which stain well.

No. 3.—*Eye lost probably by Corneal Ulceration eight years before Excision—Changes in Retina and Choroid.*

Ann L., æt. 24, single. Right eye excised by Mr. Bowman, September 19, 1876.

A rather delicate consumptive-looking girl, with blue irides. When *æt.* 16, whilst in the third week of convalescence from an illness said to be low fever and whooping cough, a sudden inflammation of the right eye came on with photophobia, lachrymation, and swollen lids. It was treated with leeches, fomentations, &c., but it got worse, and in a week she had only perception of light. Then the pain, which had been very severe at first in that side of the head and in the temples, got better, and the eye got quiet. The left was unaffected. Three years after this, she says, she was operated on here as a preparation for wearing an artificial eye for the right, there being no sight in it. In fourteen days she began to wear the eye, which caused irritation directly and ever since. During the last twelve months the discharge has been greater, and the *left* has not been so strong, for it pricks and runs occasionally. Its $V = \frac{2}{20}$ barely, $H =$ about $\frac{1}{30}$. The *right* is now slightly shrunken and squared. Its tension is normal. *Cornea* small, oval transversely, margin bluish, central part white, opaque, and moderately vascular. The *sclerotic* is thickish behind, but thinner as it passes forwards. *Choroid* is *in situ*. Extending from optic disc to the upper and inner side, where it expands to form a large patch, is an area full of dense black dotted pigment, and with also some superficial looking white streaks on it. The *retina* is *in situ*. The *optic disc* is swollen and its blood-vessels small. In front of these, on the side towards the yellow spot, is a thin bluish white haze of opacity. On the ciliary processes below, there is a thin layer of lymph. The vitreous is rather fluid.

The retina at the periphery shows a dark coloured network, apparently the retinal blood-vessels. This seems to be due to an aggregation of indistinct rounded or irregular bodies containing black pigment, in or on the walls of the blood-vessels. Another specimen taken from the retina over the mottled patch shows these dark streaks more clearly, and many of them lead into darker patches similarly made up, which appear to bear the same relation to the streaks as do the capillary dilatations sometimes met with in glaucomatous eyes to the retinal vessels themselves.

The choroid of the mottled patch is closely united with the retina, and sections of both show the lamina fusca and an outer layer of stroma to be normal. Then the inner choroidal layers are replaced by an irregular mass of coal-black pigment,

which appears a little fibrous in arrangement. The retinal pigment layer and the outer granules are deficient, and their place is occupied by some thin, irregular, longitudinal fibres, containing a few scattered nuclei. Inside this is the inner granule layer, and inside this the atrophied nerve-cell and -fibre layer containing the above described dark streaks. These are found rarely through all the structures internal to this coal-black choroidal pigment.

In other places the choroid has all its layers perfect and its stroma well developed, though towards its inner part there are occasional indications of an accumulation of pigment. There are extremely few staining nuclei scattered through the choroidal tissue; near the yellow spot the retinal structure more approaches to normal.

The retinal layers are perfect near the optic disc. Their pigment epithelium runs nearly, and the vitreous lamina of choroid quite up to the disc.

No. 5.—*Chronic Glaucoma—Nuclear Cataract—Old Iritis—Cystic Degeneration of Peripheral part of Retina.*

Eliza B., æt. 56, married. Left eye excised by Mr. Streatfeild, September 21, 1876.

The *cornea* is rather convex, clear except just below its centre, where there is a slightly raised semi-opaque patch. The *sclerotic* is about normal. The *choroid* has its stroma but moderately developed, the epithelium lining it is perfect. The rods, cones, and blood-vessels of the retina all seem normal. The yellow spot is of a marked yellow colour, and the optic disc deeply cupped. The lens is *in situ*; its periphery is clear; its central nucleus is amber-coloured and opaque. The pupil is of medium size and rather irregular; its margins are adherent in several places to the front surface of the lens; the iris is thickened and dull; the vitreous is normal.

Sections of the lens show its nucleus to be soft and sticky; it has a fibrous structure, but the fibres seem to be swollen and to tend to cohere into short columns or blocks; the peripheral part is nearly normal; sections of the *cornea* show it generally to be normal, but in one place its anterior elastic lamina is wanting, and in its position is some indistinct fibrous tissue containing

numerous round or irregular nuclei which stain readily, and are traversed by capillary blood-vessels. These nuclei pass gradually into those of the cornea proper below them.

The retina and choroid of the posterior part of the eye seem to be nearly normal, the latter containing a fair number of nuclei and blood-vessels; but as we advance in front of the equator, the rods and cones seem short and knobbed at their extremities, and still further forwards the radiating retinal fibres, which are well developed, separate and enclose between them spaces which at first scarcely encroach on the granules, but as the retina passes further forwards begin to do so till we have nothing on the inner side of these large spaces but the thin nervous layer, and on the outer surface but the basement membrane which here supports no rods or cones.

Close to the ora serrata the retina becomes gradually about one-fourth thicker than at the periphery, and it is made up of little but the thin nerve layer and this row of spaces separated by Müller's fibres and a few granules.

Here the choroid is about half the retinal thickness.

The patient is a thin weakly woman; she has always had ample food. She came here in 1870, with chronic glaucoma of *left* eye, deep cup, and bare p. l. The *right* was normal, no operation was then advised.

For the last two years there has been severe pain in the *left* every two or three days, lasting twenty-four hours or longer, and now she comes with *left* T+2; no p. l. *Right*, sight failing, $V = \frac{29}{40}$, T = +? Left excised.

No. 6.—*Punctured Wound of Cornea, Iris and Lens, with Prolapse of Iris—Lens Substance Soft but Transparent—Optic Disc Swollen.*

Henrietta E., æt. 13. Left eye excised by Mr. Hutchinson, September 25, 1876.

On September 15, the left eye was wounded by an awl; two hours afterwards trifling aching pain came on which lasted for twenty-four hours only. Next day she attended here, when there was slight hypopyon and prolapse of the iris. On the 18th, the hypopyon was increased, but the pupil dilated well. The lens was clear. There was ciliary injection and a greenish reflex from

the fundus, but no pain; good perception of light and normal tension. 21st, Less hypopyon. Condition then and at excision much the same.

At excision the pupil was a little drawn to the upper and inner part, where a small scar close to the corneal margin indicates the original wound. The iris is thickened. The vitreous is greenish, opaque behind, and readily separating from the retina there, glassy in front where it is traversed by white streaks of lymph radiating back from the semi-opaque lens capsule near the wound; here also it can be readily stripped from the ciliary processes, leaving them quite free from lymph.

The iris is closely adherent to the corneal scar, which is in such a position that the lens must have been wounded. The lens substance is soft, though quite transparent. The choroid is normal. The retina near the swollen optic disc is milky, with a few whitish dots on its surface. The right eye was quite unaffected throughout.

No. 7.—*Examination of an Eye lost after Extraction of Cataract.*

Peter B., æt. 50. Right eye excised by Mr. Hutchinson, on September 25, 1876. A man of fair bodily health, though very nervous.

Six years ago his wife noticed a white appearance of the *right* eye, and on attending at one of the Metropolitan Hospitals, it was found to be nearly blind from cataract, and an operation was offered. The patient preferred to be treated as an out-patient, and went home, a distance of three miles. After the operation, when he got home there was a little pain in the eye, lasting some time. There never was any vision after the operation. The *left* was never inflamed.

On *excision*, the globe is normal in size, its lower corneal third occupied by a whitish semi-translucent vascular opacity, involving the whole corneal thickness; to this the *iris* is closely adherent; with it also and with the iris is closely connected a tough white fibrous plate, probably representing the lens capsule. The *sclerotic* is normal. The choroidal stroma is thin; a whitish patch is seen near its periphery and another just behind the ciliary processes. The *retina* seems normal, the *optic disc* swollen, its arteries small, and its veins about normal. The tension of the eye is normal.

The *left* counts fingers at six feet. Tension normal; pupil active; lens opaque; no irritability. Till one year ago this eye had perfect vision, but for this last month there has been much more rapid failure of sight.

No. 10.—*Wound of Cornea, Iris, and Lens extending two lines into Ciliary Region—No Sympathetic Irritation.*

Jesse P., æt. 14. Right eye excised by Mr. Hulke, September 30, 1876.

Seven weeks ago the eye was wounded by the explosion of a ginger-beer bottle. In the first two weeks he had no pain, and had bare p. l. Then he came here and was in-patient for a fortnight. Then he went home for three weeks, but the eye got a little tender, and there was some ciliary injection: on which account he was advised excision. The other was unaffected.

There is a wound across the cornea, at the junction of its upper third with the rest; its inner end extends two lines into the ciliary region. The pupil is small, its upper margin with the iris all along the scar is involved in the corneal wound.

The *lens* is quite soft but transparent. The retina at the upper and outer part of the globe is detached; and at the ciliary region, where the wound extends, the sclerotic, choroid and retina are united together by a white firm cicatrix.

The choroid and retina appear to be normal in structure.

No. 764.—*Examination of a Globe which has caused Sympathetic mischief.*

Fred. D., æt. 15. Left eye excised by Mr. Hutchinson, July 13, 1876.

Globe oval transversely, smaller than normal. Lower part of cornea a little dotted and irregular, with superficial calcareous-looking deposits. A faintly-seen rim-like iris lies in the periphery of the anterior chamber. The pupil is closed.

The *sclerotic* is thick. The *choroid* is dark coloured, and rather soft and velvety in appearance generally, though its inner part has fine mottlings of lighter greyish red. The retina is *in situ*. The optic disc white and not cupped. The anterior

chamber is absent, and behind the iris, and closely adherent to its pupillary margin and adjacent posterior surface is a tough scale visible through the cornea representing the lens. The ciliary processes above have a fine whitish grey deposit on them. They do not appear to be stretched away from their attachments.

When æt. 7, the left was injured by a tipcat. Two years afterwards the right eye began to fail, and its vision is now reduced to perception of shadows.

No. 771.—*Glaucoma in an Eye which has been previously Operated on for Cataract.*

William F., æt. 67, a very grey, though strong and hearty man. Right eye excised by Mr. Lawson, July 18, 1876.

Fourteen years ago he was operated on here for cataract of right eye. It was probably a flap extraction. A third of the vitreous was lost then.

Afterwards the pupil was irregular, but the case did well, and he could read the smallest print with the eye by the aid of glasses. He after that wore $+3\frac{1}{2}$ for *each* eye, with which he now reads J.1 with the *left*, though he reads J.4 or J.6 as well with $+\frac{1}{10}$ as with the stronger glass. For eleven years he got on well with both eyes, and then constant pain, at times extremely severe, came in the *right*, and the eye felt to him as hard as wood. It used to beat just like a "pulse." In about a year it caused a dulness in the *left*, which has been increased during the last nine months. He has had occasionally also in this eye a hemiopia, the left side of objects not being visible. Since the excision the vision of the *left* has much improved.

At excision the right cornea was hazy, vascular, and bulging. T+1. No p. l. Often severe pain. The pupil is large, oval transversely, and rather displaced towards the upper part of the cornea. The iris is short above, and entirely adherent in its upper third to the cornea. The scar of the old operation wound is not distinct, but it appears to be upwards and well within the cornea. The rest of the iris is tremulous, and a little thick and greyish. There are no remains of the lens or its capsule visible. The sclerotic is a little rigid, but about of normal thickness.

The *choroid*, just behind the ciliary processes, is pale, and has dark mottlings here.

The *retina* is slightly detached above. The disc is deeply cupped. The vitreous a little fluid. The ciliary processes are rather greyish and irregular, as if from atrophy.

It would appear as if a flap extraction, through the pupil, had been originally done, and as if the results had been extremely good, though there was an extensive anterior synechia above. Ultimately, however, glaucoma came on, for which the eye was excised. From his wearing similar cataract lenses for each eye, one might infer that the left (which has not been operated upon) was not a good eye at the time of operation, and that it has changed very little since then.

He has always had good health, and has drank beer and smoked tobacco freely.

No. 773.—*Enlargement of Globe, especially of Anterior Chamber, possibly Congenital.*

Arthur D., æt. 5. *Left* excised by Mr. Hutchinson, on July 20, 1876. The globe was increased in all its diameters, especially the antero-posterior, a great proportion of the enlargement being in front of the iris. The cornea is quite clear; its curvature is apparently uniform. The iris is normal; the pupil circular and of moderate size. The *sclerotic* is rather thin, especially behind the insertions of the *recti* muscles.

The *choroid* is elastic, deficient in pigment, its veins distinctly seen. The optic disc not cupped, its blood-vessels rather small.

The *lens* clear and *in situ*.

He is rather delicate looking; did not walk till three years old. When æt. six weeks the eye was noticed as being a little larger than the other. Since that it has been gradually increasing in size. For the last two years he has seemed to suffer a little pain in it. The other eye has never been affected. The family is a delicate one. Two of the other children have died in convulsions.

PART II.

A Periscope

OF

CONTEMPORARY OPHTHALMIC LITERATURE.

Operations for Traumatic Colobomata of Eyelids.—Dr. H. Knapp insists on the importance of the removal of any cicatricial tissue present. In a case recorded of gap in the lower eyelid, he obviated the tension produced when the edges were brought together, by incising the outer canthus, and then separating the adjacent skin below subcutaneously. He uses fine Chinese silk for sutures, is careful to put in enough, and bandages both eyes. He points out that it is the action of the orbicularis which separates the edges of the wound in the eyelid; and to obviate this separation, either vertical incisions should be made on either side the coloboma, through the skin and muscle, or division of the outer canthus, &c., should be practised. Careful union of the edges may suffice in some cases, and may be aided by supporting sutures, through whole thickness of lid, and a quarter of an inch from the edge of the wound and supporting strips of plaster. The latter, however, are scarcely applicable. Both eyes should be closed. The inner portion of the lower eyelid, in a severe case, may be loosened with scissors, subcutaneously, without injuring the canaliculus, sac, or tarsal cartilage, or dividing the inner commissure. Three woodcuts are given. (Archives of Ophthalm. and Otol., Vol. v, No. 1, p. 18.)

Anthrax of Lower Eyelid.—Dr. H. Knapp records a case of carbuncle of the inner surface of the lower eyelid in a boy. He regards it as a rare disease. He practised and recommends free incisions. (Archives of Ophth. and Otol., Vol. v, No. 1, p. 28.)

Cysticercus Cellulosæ of the Upper Eyelid.—A case under the care of Dr. Wecker is noted in the Annales d'Oculistique, Mars-Avril, 1876, p. 146. The tumour was removed entire.

An Epidemic of Conjunctival Blenorrhœa caused by Conjunctivitis Gonorrhœica—Dr. Brunhuber remarks on the fact that the affection only spread to eyes already damaged by some inflammation. The cases were in different rooms of the same hospital, but near each other. Three patients became affected—the second

probably from contact, one day they were together for some time; and the third from the second by means of a sponge. Attention is called to the fact, that the infection occurred at a time when the discharge had almost ceased, and it might have been expected that danger had passed. (Zehend. Monatsbl., xiv, Jan.-Feb.)

Transplantation of Conjunctiva from the Rabbit in Symblepharon.—Dr. Joseph Imre records two unsuccessful attempts, and remarks thereon and refers to the literature of the subject. (Zehend. Monatsbl., xiv, July-August, pp. 256-267.)

Primary Lupus of the Conjunctiva.—Dr. Pflüger records a case treated by puncturing and use of nitrate of silver. (Zehend. Monatsbl., xiv, Mai.)

Congenital Strabismus.—Dr. Pflüger records two cases. When the patient looked straight forwards, there was divergence. On turning the head to one side the eyes became straight, and then, if the movement was continued further, the eye which had diverged, converged. Vision in each eye was good. In each case the right external and internal recti were affected. The alternation between convergent and divergent strabismus was remarkable. In one case the right eye was myopic $\frac{1}{30}$; the left, $\frac{1}{20}$; in the other the sight was normal, whilst the left was myopic $\frac{1}{18}$; that is, in each the squinting eye showed a lower refraction than the other. (Zehend. Monatsbl., xiv, Mai.)

Operation for Strabismus.—Dr. Driver says he has for years never operated on the shortened muscle, but has dealt with its antagonist. He does not simply stitch the muscle forward so that one portion overlaps the other, as Noyes does, but he divides the muscle, and cuts a piece away proportionate to the amount of the squint. He only uses two sutures, and takes care to pass one before dividing the muscle, thus avoiding the trouble of hunting for the end retracted within Tenon's capsule. The advantages claimed are, (1) that he always attains his object by one operation. He has now operated on 53 cases. (2) As the insertion of the muscle is not dissected away, but the muscle is divided beyond it, the risk of altering the direction of traction of the muscle is avoided. (3) Healing takes place more rapidly than after the ordinary plan of stitching, as the conjunctiva is not involved. The stitches can be removed in 48 or 72 hours. (4) The motions of the globe are not interfered with as is the case when the shortened muscle is retracted. (Zehend. Monatsbl., xiv, März-April, p. 133.)

Buphthalmus Congenitus.—Dr. Fritz Raab records the case of a girl aged 5 years, the subject of buphthalmus congenitus; and the results of his examination of an eye removed from a boy ten years of age. (Zehend. Monatsbl., xiv, Jan.-Feb.)

The Influence of Opacities on the Cornea, in producing Strabismus.—Dr. Hirschberg contributes a paper on this subject.

(Centralblatt f. Med. Wiss., Aug. 14, 1875.) During the stage of inflammation of the cornea, whilst a child keeps the eye constantly turned upwards and inwards, a squint may result from contraction of the internal rectus, but opacities on the cornea can only lead to strabismus when hypermetropia is present. They may favour internal strabismus by making any false image produced less obvious to the patient, but more usually by causing the light to fall on the retina to one side of the centre. If an eye affected with an opacity is accurately focussed for rays coming from an object, the image formed will be central; but if the retina be out of focus, then the interception of rays by an opacity will cause the circles of dispersion on the fundus to be placed excentrically. It can be shown experimentally that the form of the aperture through which light is admitted does not prevent the light falling in an axial direction through a lens on to a screen placed exactly in focus; but if the screen be out of focus, the circles of dispersion will be placed excentrically, unless the aperture admitting light be circular. The opacity in front of the pupil will practically prevent the aperture admitting light being circular; and therefore, if the eye be hypermetropic, the circles of dispersion formed on the retina will be to one side of the centre. As soon as the eye begins to squint, it will be found that the convergence helps the other eye to see, by allowing a greater effort of accommodation, and thus an internal strabismus is maintained. If the eye affected with opacity is hypermetropic, whilst the other is normal, or is more hypermetropic than the one without opacity, then it can never be in focus at the same time as the other. If we try to remedy a strabismus by glasses, we must test and correct each eye separately. Opacities on the cornea without inflammation, and without errors of refraction, cannot give rise to strabismus.

Congenital, almost complete, Staphyloma of the Cornea.—Dr. Treitel describes the specimen, and gives an illustration of a section through the eyeball (fig. 3, plate 2.) (Graefe's Archiv., Bd. ii, Abth. 2, p. 231.)

Neuro-Paralytic Keratitis.—Dr. Treitel records a case. There was a tumour of the left side of the base of the skull, involving the Casseiran ganglion, &c. There was a remarkable atrophy of the left optic nerve at one part near the optic foramen, probably caused by pressure. (Graefe's Archiv., Bd. xxii, Abth. ii, p. 239.)

Case of Sclerosing Keratitis.—Dr. Baumgarten had an opportunity of examining an eye microscopically, which had presented to the naked eye an appearance as if the sclerotic had encroached on the cornea. No evidence was obtained that this had really occurred. There was a plentiful cell-growth, and fatty degeneration. The case and appearances are described in detail. (Graefe's Archiv., Bd. xxii, Abth. ii, pp. 185-203.)

Experiments on Keratitis from Inoculation.—Dr. G. Stromeyer records the results of injecting septic material into the cornea, with the view of exciting a spreading ulcer and hypopyon. He summarises to the effect that, (1) by injecting decomposing organic fluids, or those capable of decomposing, into the cornea of the rabbit, we may excite a keratitis which, both in its tendency to further extension and its local symptoms, has the greatest similarity with the hypopyon-keratitis met with in the human subject. (2) We may excite a very similar inflammation by injecting masses of bacteria artificially procured, and free from foreign admixture. (3) This latter keratitis differs from that excited by the injection of septic or specific material (diphtheritic, pyæmic, &c.), owing to its tendency to spontaneous subsidence. (4) The injection of artificially procured bacteria masses into the chamber is followed by a severe adhesive iritis resembling that following injection of the cornea. (5) The fluid used for the development of the bacteria, when injected in a state of dilution, still competent for the nourishment of the bacteria, has no influence on the cornea, or anterior chamber. (6) By prolonged boiling, the bacteria may be killed, and rendered inert. (7) The spreading of the substance injected takes place by continuity of tissue, and not by the aid of the anterior chamber, or absorption from the conjunctival sac. (8) A part of the naked eye changes in the cornea is caused by collections of fungus elements. (9) Salicylic acid does not appear to exercise any influence as an antiseptic in such keratitis. (Graefe's Archiv., Bd. xxii, Abth. i, pp. 100-140).

Investigations on Keratitis.—S. Stricker insists on the importance of following out the steps of a process he details, in order to arrive at satisfactory results. He experiments on the corneæ of kittens. A dry stick of caustic potash is used to cauterise the cornea, and nitrate of silver subsequently to stain it. The cornea is excised a few minutes after staining, and placed in water slightly acidulated with acetic acid, and left for two days or more. Excellent lamellar preparations can then be obtained. The corneal corpuscles ramify in different directions, and by their processes form a network. When the inflammation begins, these processes swell, and the meshwork becomes coarser. As the process becomes more developed, the swelling becomes greater. The cornea at this part is now traversed by a thick meshwork. This condition may be regarded as the stage of inflammatory swelling and infiltration. The meshwork is composed entirely of cells and cell processes. Lines of demarcation are formed between individual sections of a cell or a process; that is, the cells and processes "divide." As the meshwork and its branches swell, the basis substance (matrix) which is visible in its meshes gradually diminishes. Finally, these islands of matrix become smaller and smaller, until they disappear. The mosaic-

like meshwork has become a mosaic-like nodule. This nodule has taken the place of the normal tissue, and when the adherent cells, which have already become divided, actually separate and fall apart, the tissue is disintegrated, and suppuration has occurred. The products of the cell division are either pus corpuscles or still smaller bodies, and the author has not decided whether they are still capable of development, or whether they are merely masses of detritus. The inflammatory swelling and the suppuration are limited by the line of demarcation which exists between the living cells and the dead. The author says the main thoughts running through his remarks are—

1. That the swelling of the branched corneal corpuscles determines the nature of the inflammatory swelling, as well as of the inflammatory infiltration. 2. That infiltration does not mean suppuration, but merely one of its preliminary steps, a step from which a return to the normal condition by diminution of the swelling is conceivable. The tissue is infiltrated with the still undivided substratum of purulent formation. The infiltration may disintegrate into pus, but in the beginning it is certainly not pus. In conclusion, certain changes in nerve-fibres in the inflamed part are pointed out. Their contents underwent segmentation just like the branched cells. Either the endothelium swells and becomes segmented, or the axis cylinders have become segmented, or else the two conditions exist together. Illustrations are appended. (*Archives of Ophthalmology and Otology*, Vol. v, No. 1, p. 1).

Pterygium.—Dr. F. Mannhardt has a paper on this subject in *Graefe's Archives*, Bd. xxii, Abth. i, pp. 81–102.

A Method of Fixing a Thread to a Needle.—Dr. G. Martin adopts the plan of threading the needle (armed in the ordinary way) and the short end through the long end near the needle in two places. The tighter the long end is then pulled, the firmer is the short end held. If desired, a second needle may be used. If so, the first needle is armed in the ordinary way, the second needle is threaded on the short end, and then the point of the second needle is passed through the long end near the first needle twice. By this means, the short end is threaded twice through the long end, and gripped by it, so that it cannot slip, and there is no projecting knot to obstruct the passage of the thread. (*Annales d'Oculistique*, Mars-Avril, 1876, p. 117).

Iridotomy (or Iritomy).—Dr. Wecker finds that it is well to operate much earlier than he formerly supposed after extraction of cataract, and subsequent closure of pupil and traction of the iris towards the wound. By operating during the inflammatory stage, he cuts short the mischief, and avoids that extreme stretching of the iris which often ensues. He has modified his scissors by making one blade sharp-pointed, so that it is not necessary to perforate the iris, &c., before entering them, and

thus bleeding is obviated. The blunt-pointed (upper) blade is one millimeter (half a line) longer than the other, and, when the blades are closed, acts as a guard to the sharp one. He makes an incision with his *couteau à arrêt* at the outer part of the cornea (within the sclero-corneal junction), if the cataract has been extended upwards, so that the incision lies vertically to the transverse diameter of the cornea. In withdrawing the knife, care should be exercised to allow the aqueous to escape very slowly. The scissors are introduced, and opened almost directly, the sharp blade being below. They are pushed straight on, the sharp blade perforating the iris, &c., and when they have reached a sufficient distance well across the iris, on the other side of the pupil, a quick snip is made, thus making a transverse cut in the iris, &c. The upper and lower portions of the iris then retract, leaving an oval pupil, with its long axis transverse. If the pupil be drawn very much towards the cataract wound, then the knife must be entered somewhat higher up. If, however, the pupil be near the centre, then the knife (as stated) must be entered opposite the transverse diameter of the cornea. If the result of the first operation does not give a good pupil, yet the inflammation is checked, and the eye is in a better state for a second iridotomy. Woodcuts are given. (Zehend. Monatsbl., xiv, Sept., p. 281, and Annales d'Oculistique, Mars-Avril and Juillet-Août, 1876, p. 36.)

Primary Sarcoma of the Iris cured by Excision of the Tumour.—Dr. C. J. Kipp records the case of a man, aged 36, who had noticed a reddish nodule at the lower margin of the iris in the right eye for about twelve years. The growth had been exceedingly slow till about a month previously. For a few weeks, the sight had failed. The anterior chamber was partly filled by a growth of a flesh colour attached to the inner and lower quadrant of the iris. A sketch is given. An incision having been made in the cornea of sufficient size, the tumour and adjacent portion of iris were drawn out with forceps, and the portion of iris snipped off. The patient did well, and the vision at the end of a fortnight was quite normal. The growth proved to be a white spindle-celled sarcoma. There was no history of injury. The author quotes three other cases recorded. In addition, we may call attention to one recorded in the Ophth. Hosp. Rep., Vol. v, p. 230. The patient was a man, aged 25. The tumour was of slow, painless growth, and unattended by inflammation. It contained pigment. At p. 189, a somewhat similar case is noted, but here the growth was not limited to the iris. (Archives of Ophth. and Otol., Vol. v, No. 1, p. 34).

Death after Iridectomy.—Dr. S. Klein places on record the case of a girl, aged 6, on whom he performed a double iridectomy for opacities in the corneæ. Chloroform was administered. The next day, she complained of slight pain in one eye. A few hours later, convulsions came on, she became insensible, and died. The

post mortem showed congestion of the brain and lungs. (Zehend. Monatsbl., xiv. Mai, p. 171).

The Diseases which accompany Iritis, or are secondary to it.—Dr. J. Schmabel writes a detailed article on this subject in the Archives for Ophthal. and Otol., Vol. v, No. 2, p. 153. He adduces evidences to show that iritic adhesions cannot be said to be a cause of recurrent iritis. He divides the cases of chronic iritis into those in which the iritis progresses steadily; those in which there are acute exacerbations (without intervening total cessation), and those in which there are intermissions and relapses of iritis. In many of the cases of acute iritis there are no adhesions, and where there are synechiæ, patients are not by any means more liable to repeated attacks than in cases where synechiæ are wholly absent; i cases which last for years, the attacks do not become more frequent though the adhesions may become more numerous. He thinks the name "recurrent" is only applicable in a very few cases, and prefers the term chronic. He tabulates a number of cases in which he examined the fundus with the ophthalmoscope in early stages of iritis from whatever cause. He has found diffuse retinitis most frequently; changes in the vitreous comparatively seldom, and anomalies in the choroid most rarely. He lays particular stress on the early occurrence of retinitis and changes in the vitreous, and believes that choroiditis is a much less frequent complication than has been supposed, and that the vitreous changes are independent of choroidal mischief. The retinitis is often present when the iritis is but slight and lasts longer than the latter. When the vitreous is affected the retina is also, almost invariably. He argues at some length in favour of the occurrence of inflammation of the vitreous. He thinks we too readily assume its association with choroiditis. He narrates a case in which several attacks of inflammation of the vitreous occurred whilst the retina and choroid remained normal. In connection with this case he alludes to some very curious solid, opaque, greenish, filiform and convoluted fixed and floating films he has met with in the vitreous, and which he regarded as new formations. (One or two of the descriptions suggest persistent hyaloid.) In cases where the iritis subsided, but the vision began to decline, we must suspect that retinitis and hyalitis accompanying the iritis did not improve with it, but slowly aggravated and caused the amblyopia. He narrated cases showing this, and also that the deeper changes may precede the iritis and even cause synechiæ. Iridectomy has no influence on the course of the retinitis or hyalitis. If, however, circular synechia is followed by iritis and retention of the exudation in the posterior chamber, iridectomy is indispensable. Circular synechia does not of itself necessitate a relapse of iritis, but immensely increases the danger of a subsequent iritis, since it diminishes or almost abolishes the possibility of a spontaneous

recovery. The tension of the tissue of the iris by accumulated exudation causes a permanent inflammatory irritation, manifesting itself by severe and persistent pain and a disturbance of circulation, of which numerous dilated blood-vessels on the surface of the iris bear witness. If a globe has become atrophic, it will rarely fill again after iridectomy. The improvement in vision after iridectomy is due to the letting in of more light. He alludes to cases in which the vision has even become unaccountably diminished after iridectomy on account of the presence of adhesions or in glaucoma.

Sympathetic Ophthalmia.—Dr. S. C. Ayres narrates cases:—
 (1) M., æt. 4, wound of cornea, prolapse of iris and cataract resulting from injury from the beak of a bird. Sympathetic inflammation of the other eye in nine months. He could see light with the injured eye for four months. It became irritable when the other began to fail. Vision very imperfect in sympathetically affected eye. (2) M., æt. 46, vision in one eye lost directly after injury from piece of iron. Tender place left where injured. Prolapse of iris, traumatic cataract. Sympathetic inflammation in nine weeks. Second eye very defective. (3) F., æt. 6, corneal wound, prolapse of iris which was snipped off, cataract. Suppurative irido-choroiditis rapidly supervened. In five weeks, the other eye inflamed and the anterior chamber was half full of lymph and pus. Vision quite lost. (4) M., æt. 5, wound in sclero-corneal junction. Vision lost. Sympathetic inflammation in six weeks. Perception of shadows. (5) M., æt. 38, rupture of inner portion of sclerotic by blow on outer side. Lens dislocated inwards beneath conjunctiva. Sympathetic inflammation of the other eye in six weeks. Loss of vision in this eye, and gradual recovery of fair vision in the injured eye with use of strong convex glass. The following points are noted: In three of the cases (1, 2, and 3) the wound was in the cornea and was complicated with prolapse of the iris and cataract. In one case (4) the wound was at the sclero-corneal junction, opening the anterior chamber and causing prolapse of the iris, but not wounding the lens, and in case 5 there was rupture of the sclerotic with dislocation of the lens under the conjunctiva. The periods at which the sympathetic inflammation developed were as follows: in Case 3, at five weeks; in cases 4 and 5, at six weeks; in Case 2, at nine weeks, and in Case 1, slight symptoms at four months, but none severe until nine months after injury. In Case 3, enucleation of the injured eye was made within a few days after development of sympathetic trouble, but it had no good effect. In 1, 2, and 4 enucleation was practised later, also without any good effect. One striking feature in the cases is the freedom from pain, except in one nervous man. (Archives of Ophthal. and Otol., Vol. v, No. 2, p. 221)

Sympathetic Ophthalmia—Recovery of the secondarily affected Eye, and improvement of the wounded one.—Dr. J. Samelsohn contributes a paper founded on the case of a lad, aged 14, who received an injury to the left eye while playing with a hoop. There was a wound involving the ciliary region and attended by a small prolapse of iris. Treatment by atropine, leeches, absence of light, &c., was carefully carried out. Six days after the accident a small hypopyon appeared. About a month after the accident the eye became much worse, but improved again in about a week. The other eye then began to be affected with serous iritis. Enucleation of the left was recommended, but consent could not be obtained. Several iritic adhesions formed in the eye secondarily affected, but there was no marked effusion of lymph. Both improved, and at the end of ten weeks from the accident the patient returned to school. The right eye then seemed normal. In the left the prolapse of iris was completely cicatrised, but the spot was still painful on pressure. The iris acted well under the influence of atropine, but there were a few synechie. On ophthalmoscopic examination one-third of the margin of the disc passed without any line of distinction quite horizontally in the form of an opaque streak onwards towards the macula lutea (exposed sclerotic from rupture of the choroid?). The patient was seen again at the end of a year. His vision remained good in the right eye and half in the left. Diagrams of the field of vision and of the ophthalmoscopic appearances are given. In addition to the rupture of the choroid there was an opacity in the vitreous as was supposed or possibly a detachment of the vitreous (according to Iwanoff). At one time the vision in the wounded eye was so bad that it was supposed to be utterly lost.

In discussing the question by what form of disease of the injured eye, sympathetic ophthalmia may be produced, the author remarks we have in the above case an extremely complicated and extensive lesion; rupture of the choroid and retina, organised opacities, and probably also detachment of the vitreous, and finally an injury of the ciliary body with prolapse of the iris. Experience has taught us that the latter is a frequent source of sympathetic inflammation, especially when affecting the sclero-corneal junction. The other injuries have usually no tendency to produce the sympathetic mischief. The progress of the case also indicates the ciliary injury as the starting point. The inflammation following the injury must be regarded as a cyclitis, though of the serous form, and not hyperplastic. Some of the symptoms belonging to cyclitis were absent, but, on the other hand, those which particularly engaged attention, the rapid appearance and disappearance of hypopyon with alternating contraction and dilatation of the pupil without any corresponding alterations in the tissue of the iris, justified the diagnosis of cyclitis. We have a case where an exudative form (of hypopyon-

cyclitis) and not a hyperplastic cyclitis with retraction of the ciliary processes and ciliary margin of the iris became the conductor of the sympathetic process, and the observation seems to widen the sphere of the latter. For, if the hyperplastic form depends on irritation of the ciliary nerves, in consequence of the contracting cicatricial tissue, that modification of the nervous irritation which manifests itself by sudden changes of the intra-ocular pressure is illustrated in the above case as shown by the history. At the beginning the pupil was contracted, the intra-ocular pressure increased and hypopyon present, whereas the decrease of the inflammation is manifested by dilatation of the pupil, diminution of the intra-ocular pressure and absorption of the hypopyon. This series of symptoms may be explained most easily by the aid of the nervous system. The trigeminus and the sympathetic have the power of influencing the pupil and intra-ocular pressure, and how manifold the circumstances and combinations caused hereby is best illustrated by observation of certain forms of keratitis, in which, at the height of the inflammation, we find a contracted pupil, the tension of the globe diminished and a total absence (in spite of atropine) of all tendencies toward resorption; while the decrease of the inflammation is marked by dilatation of the pupil, increased intra-ocular pressure, and high absorbing power. Though no explanation of these anomalies is given in our latest works, it may be judged from an examination of the above case that the conduction of the sympathetic symptoms, by means of the ciliary nerves, is essentially increased by a sudden diminution of the intra-ocular pressure. This was anticipated by Graefe. The form of inflammation present in the above case may explain the favourable termination. For, if the changes which a hyperplastic cyclitis induces in the injured ciliary body gradually increase and eventually become permanent, it is to be inferred that the sympathetic changes depending thereon, once declared, will assume a progressive character; while, on the other hand, in that form, depending on alternating secretory anomalies, all the changeable and temporary symptoms setting up irritation will, in the same way, induce transitory sympathetic changes corresponding to the nature of the affection. The anatomical condition seems to warrant such a conclusion. In the one case there is a discoloured disorganised iris, with strong retraction of its ciliary insertion; in the other, a normal condition of the iris, a few adhesions and a distorted pupil due directly to the injury.

A differential diagnosis of these two forms may be of value in the prognosis of sympathetic inflammation and in deciding the question of prophylactic enucleation. As to the delicate question of the nature of the nervous influence in sympathetic affection, the above observation demonstrates one fact only, namely, that it is not an inflammatory process creeping along the course of the nerves

since an inflammatory process could neither so suddenly nor so rapidly transmit the changes of the primarily affected eye to its fellow. (Archives of Ophthal. and Otol., Vol. v, No. 1, p. 48.)

Spinal Myosis.—Dr. Hempel collects the cases hitherto published by Argyll Robertson and others, and narrates fresh ones. He points out that in affections of the cervical sympathetic, the pupil (as noted by Hutchinson) is of moderate size, and its condition depends on incomplete paralysis of the dilator pupillæ. Atropine causes complete dilatation. In the cases under consideration, the most striking symptom is often the extremely small size of the pupil. Here we have to deal with complete paralysis due to an affection of the *centre* for dilatation, and associated with secondary contraction of the sphincter. Atropine has only a moderate effect. That the myosis cannot be due to central irritation of the third nerve may be gathered from the fact that the ciliary muscle is not affected, as well as from the action of atropine. Paralysis of the ciliary muscle, with or without paralysis of the sphincter pupillæ, may be met with in these cases, but not spasm of accommodation. Dr. Argyll Robertson pointed out that in cases of myosis, though the pupils do not act to light, they will dilate when the accommodation is relaxed on looking in the distance, and contract when the accommodation is used in looking at near objects. This may be explained (Wernicke) by assuming that the communication between the optic nerve and the third nerve is interrupted, so that the reflex irritation of the third nerve cannot be produced by the influence of light. The centre of the third nerve is, however, intact, because reaction promptly follows in any effort of accommodation. The principal condition is probably an inability of the pupil to react to the influence of light, and the state of the pupil is probably an accidental complication. We may have (1) paralysis of the dilator (myosis); (2) paralysis of the sphincter (mydriasis); (3) paralysis of both muscles (medium size of the pupils); (4) both muscles may be competent (medium size of pupils). The first is most frequently met with in affections of the spinal cord; the second cannot be distinguished from that due to other causes, and the third may be overlooked or mistaken for simple mydriasis; the fourth occurred in Wernicke's cases. In all (three) one eye only was affected. The want of reaction to the influence of light may depend on (1) paralysis of the optic nerve, (*a*) in the course of its trunk, or (*b*) at its centre; (2) the communication between the centre of the optic nerve and that of the third may be interrupted; or (3) the third nerve may be paralysed. (Graefe's Archiv., Bd. xxii, Abth i, p. 1.)

Filaria Medinensis in the Anterior Chamber.—Dr. Barkan records a case. The patient was a man aged 30. He had long suffered from granular lids, &c., and his corneæ were opaque in great part, but the lower half of the left was clear, and a small thread-like

foreign body could be seen adherent to the lower part of the iris. The body was removed by iridectomy, and proved to be a *filaria medinensis*. (Archives of Ophthal. and Otol., Vol. v, No. 2, p. 151.)

Dislocation of a Transparent Lens into the Anterior Chamber.—Dr. G. Sous. The patient, a female aged 37, was slightly myopic, but had enjoyed good vision till she struck her eye against the back of a chair. She then noticed she could not see so well as before, but better when lying on her back than standing up. Three months later, after stooping, she noticed her sight was worse, and that it remained always much the same. She declined any operation. (Annales d'Oculistique, Mars-Avril, 1876, p. 120.)

Spontaneous Dislocation of the Lens.—Dr. J. Hirschberg gives an account of the examination of an eye removed for irritation in connexion with dislocation of the lens into the anterior chamber in a case of myopia. The patient was a woman, aged 69. She was not aware when the sight of the eye was lost, but it had only been inflamed fourteen days. The lens could be seen in the anterior chamber, its lower margin being in front of the lower part of the iris. The portion of optic nerve removed was curiously bent, and the inter-vaginal space on one side was found much dilated. Representations of sections are given. (Graefe's Archiv., Bd. xxii, Abth. i, p. 65.)

The Uselessness of Bandages, &c., after Cataract Extractions.—Dr. Gayet writes in favour of leaving the eye without any compressive bandage, as he believes it is better to allow the eye and eyelids free movement. (Annales d'Oculistique, Mai-Juin, 1876, p. 252.)

Cataract Extractions.—Dr. Driver records the results of 200 cataract extractions on Wecker's plan. In 91 per cent. he had V. from $\frac{2}{20}$ to $\frac{20}{100}$; in 4 per cent. $\frac{20}{100}$ to $\frac{20}{1000}$. In these, however, the operation was a success, but other causes led to the amblyopia. In 2 per cent. improvement was to be expected from iridectomy; in 3 per cent. the eyes were completely lost. In 99 of the cases iridectomy was performed; in 101 the pupil remained sound. Loss of vitreous occurred three times, twice in the first 50 cases and once only in the last 150. Most of the patients were sent out within a week; the average stay was $9\frac{1}{2}$ days. Chloroform was not given in any case, and in the last 109 cases no assistance was necessary during the operation. (Zehend. Monatsbl., xiv, März-April, p. 135.)

Cases under care of Dr. Wecker noted. (Annales d'Oculistique, Mars-Avril, 1876, p. 124.)

The Extraction of Cataract amongst the Greeks and Romans.—By Dr. Hugo Magnus. (Graefe's Archiv., Bd. xxii, Abth. ii, pp. 141-184.)

Pyramidal Cataract.—Dr. Goldzieher records the results of his examination of three cases. In two the cataracts were con-

genital, in the third acquired. In all, the capsule passed over the cataract. In the acquired one there was an adhesion between the lens and the iris. (Centralblatt f. Med. Wiss., Dec. 4, 1875, from Pest. Med. Chir. Presse.)

F. Poncet reports on a case of double congenital pyramidal cataract. The capsule passed over the pyramid. The result of his examination indicated an inflammatory process at an earlier period in the cornea, iris, and anterior capsule. He considers the pyramidal cataract to be a conical projection of the anterior capsule brought about by traction when the lens, adherent by past inflammation, is again pressed back by the aqueous. (Centralblatt f. Med. Wiss., Mar. 22, 1875, from Arch. de Phys.)

On the Histology of the Lens.—Dr. Ritter continues his investigations on the structure of the lens by giving an account of the structure of the centre of the lens in the calf. (Graefe's Archiv., Bd. ii, Abth. ii, p. 255.)

The State of the Ciliary Processes during Accommodation.—Prof. Hjort has investigated the position of the ciliary processes during accommodation in a case of absence of the iris and in Albinos. He used Calabar Bean, and magnified by means of a Brücke's lens. By this means he obtained a good view, and he gives figures showing what he saw. He found that the ciliary processes came forwards so as to be more visible, and seemed to enlarge. The edge of the lens became thicker. The space between the lens and the apices of the ciliary processes remained unaltered. The edge of the lens seemed to be further from the base of the processes (sclerotic margin). His observations tend to demonstrate the truth of the received views on accommodation. (Zehend. Monatsbl., xiv, Juli-August, pp. 205-222.)

Myopia and Cataract.—Prof. Hasner has investigated statistically the question of the more frequent occurrence of cataract in myopes. He found cataracts in 16 per cent. of myopes. Low degrees of myopia do not seem to be specially inductive of cataract. In myopia of moderate degree cataract seemed relatively frequent, and in higher degrees iritis, choroiditis and hyalitis were common and may easily lead to cataract. Cataract presenting the ordinary signs of the senile form did not appear specially frequent before the age of 50, but afterwards it seemed so. It does not appear (as has been stated) that cataract in myopes progresses particularly slowly. (Zehend. Monatsbl., xiv, Juli-August, p. 251.)

The employment of a Lens, combined with a Stenopæic Apparatus, in certain cases of Anomaly of Refraction, with diminution of the Acuity of Vision.—Dr. Badal has found that in some cases of irregular astigmatism, excessive myopia, or opacities on the cornea, vision is improved by a pin-hole aperture and a lens, when either alone is scarcely of any use. The aperture shuts off too much light, and a lens magnifies, but diffuses the images. The two combined will sometimes give remarkable results. The lens magnifies and collects

the light, whilst the pin-hole aperture gives sharpness to the image. (*Annales d'Oculistique*, Mai-Juin, 1876, p. 248.)

Optometer, on the metrical system, for the simultaneous measurement of the refraction and of the acuity of vision, even in illiterate persons. Dr. Badal (*Annales d'Oculistique*, Mars-Avril, 1876, p. 101.)

Spectacles consisting of Reflecting Prisms for use in insufficiency of the Internl Recti, &c.—Dr. Boëtcher describes and figures some glasses he contrived for a patient who could not converge long without being tired; the prisms are rhomboid in shape, and the two together correspond to the distance between the pupils. Each is 14 mm. (half an inch) thick from before backwards, and 16 mm. from above downwards: they are so placed that the rays from a near object falling on the long anterior surface of each prism, are reflected by the hypotenuse (which makes an angle of 45° with it) through the length of the prism, and then by the other hypotenuse to the eye; by this means the object is seen under an angle one-fourth of what it would otherwise be. The prisms meet over the nose, and this must be protected from pressure. The four reflecting hypotenuse surfaces must be covered with black taffeta, but the latter should not be in contact with the glass. The upper and lower surfaces of the prisms must be blackened and also those portions in front not required for the transmission of rays.—(*Graefe's Archiv.*, Bd. xxii, Abth. i., p. 73.)

Dilatation of the so-called Canal of Petit and Secondary Detachment of the anterior part of the Vitreous.—Dr. Hermann Pagenstecher narrates cases in which vision was lost generally with increase of tension, and in which on examination of the eyes after removal he has found changes leading him to conclude that dilatation of the canal of Petit had occurred from effusion from the ciliary processes, &c. Several illustrations of sections through the eyeballs are given (Plate V). He finds also that fluid injected into the anterior chamber makes its way into the canal of Petit and pushes the vitreous backwards. Iridectomy if made well back must open this canal and allow of the escape of any fluid effusion. The size of the iridectomy does not matter so much as that it should be peripheral. (*Graefe's Archiv.*, Bd. xxii, Abth. ii, p. 271.)

Anatomical Examination of a Coloboma of the Iris and Choroid.—Prof. W. Manz gives a detailed account of an examination which he made of two eyeballs showing coloboma. One of the chief features of interest was the fact that he found the retina and choroid adherent at the coloboma, as if it were in some measure a scar, and that remains of retinal tissue were still present. Representations of a section through the eyeball and another through the coloboma are given. (*Zehend. Monatsbl.*, xiv, Jan.-Feb.)

Large Orbital Sarcoma removed without removing the Eyeball—Death from Acute Nephritis.—Dr. H. Knapp records the case.

(Archives of Ophthal. and Otol., Vol v, No. 2, p. 131.) The patient was a man, aged 38, who came under care for a high degree of exophthalmos of the right side. He had suffered for years from inveterate syphilis. The apex of the left lung was dull on percussion; his digestion was poor, and he suffered from diarrhœa. The exophthalmos had been noticed about two years; the eye was quite blind, the media were clear, and the disc could be seen to be in a state of neuritis descendens. A tumour could be felt at the inner and lower part of the orbit; it seemed separate from the globe, but not from the orbital wall. The tumour was rapidly growing, and its removal was necessary. As the eyeball seemed separate from the growth, it was thought the latter might be removed without enucleating the globe. The tumour was found to implicate the optic nerve and to pass far back to the apex of the orbit. The nerve was divided and all the tumour removed (with some difficulty), except a portion passing into the inferior orbital fissure. A portion of the floor of the orbit was removed and then the maxillary sinus opened; the eyeball was pushed back and the upper eyelid which had been divided vertically stitched. The globe seemed of normal tension, and sensation was lost over its inner half. The daily progress is given and the ophthalmoscopic signs noted. Ulceration of the *outer* part of the cornea occurred. There was free suppuration, and the patient sank on the twelfth day after suffering from diarrhœa, vomiting, delirium, coma, &c. The postmortem showed a tough greyish infiltration of the apex of the left lung, of the size of a fist; acute nephritis of both kidneys, gummata in the liver and one testis. The antrum was full of pus, and the growth had extended into the inferior orbital fissure. On examination the tumour proved to be a periosteal sarcoma. Under the microscope the cellular elements were greatly in excess of the fibrous, and consisted of round, oval, spindle or giant cells. Parts of the recti muscles were infiltrated, and the optic nerve and adjacent parts of the retina. Sketches showing a section of muscle and of the entrance of the optic nerve are given. Dr. Knapp makes some interesting remarks on the case. We allude to a few points. The growth filled the greater part of the orbit, involved and disorganised the inner rectus muscle, surrounded the optic nerve, invaded the outer sheath at one place only, and there penetrated into the nerve itself. This place was the point of contact between the periosteum and the sheath of the nerve at the optic foramen. The growth spread along the nerve in the direction of the globe only. The sarcomatous elements were present in the bundles of the nerve-fibres and absent in the interstitial connective tissue. It has been already mentioned that the intra-ocular end of the nerve and the adjacent retina were infiltrated with sarcoma cells. It is common enough for growths to spread from the eyeball along the optic nerve to the orbit, but this case shows the reverse. Dr. Knapp, thinks orbital

tumours do not cause neuritis by mere pressure or obstruction to the circulation, but only by encroaching on the sheath of the nerve and causing inflammation of the nerve itself. In a previous case of extirpation of a portion of the optic nerve (see *Periscope*, Vol. viii, p. 613), no blood-vessels were visible in the fundus for three or four days, but in the present case the vessels never disappeared entirely, and the fundus was reddish white; the reddish colour increased day by day. This was also noticed in a case in which Dr. Gruening removed a myxoma of the optic nerve with preservation of the eyeball. This depends on anastomosis of the branches of the ciliary arteries with choroidal vessels. It is noted that the patient whom he operated on previously remained well at the end of two years; Dr. Gruening's patient also did well. In conclusion, it is pointed out that it was remarkable the ulceration of the cornea should occur on the outer side and not on the inner side which was anæsthetic.

Cysticereus in the Orbit.—Dr. Waldhauer records a case and refers to others. (Zehend. Monatsbl., xiv, Mai, p. 152.)

Voluntary Suppression of a Divergent Squint coincident with vigorous exercise of accommodation.—The patient, though when his eyes were passive he had a considerable divergent strabismus and could see well, yet had the power of bringing the eyes parallel, but with a simultaneous exercise of accommodation, requiring a -6 glass to enable him to see in the distance. The same anomaly existed as regards near vision. The external rectus of the squinting eye was divided with partial improvement, then that of the other, and finally the first was divided a second time; the eyes were now straight, and the sight of the squinting eye was improving by exercise. He had not lost the power of extreme convergence however, as he could now voluntarily produce a convergent strabismus. Dr. W. Block. (Zehend. Monatsbl., xiv, Mai.)

Calabar Bean in Glaucoma.—Dr. Laqueur has employed Physostigmine (Dequesnel's Neutral Sulphate of Esérine) in some cases of glaucoma with advantage. He uses a watery solution ($\frac{1}{3}$ to $\frac{1}{2}$ p. c.), three or four drops being instilled (at intervals of twenty minutes) daily. The remedy may be continued for three or four weeks without any ill effect. At the end of three to four days great improvement resulted in five cases of glaucoma simplex, and one case of secondary glaucoma. Whether the result is permanent may be open to question, but the diminution of tension lasts long after the pupil has resumed its normal size. On the normal eye it does not seem to have any effect in diminishing the tension. Its effect on glaucomatous eyes may possibly be due to its directly stimulating the smooth muscular fibres of the choroidal vessels. The author thinks the remedy is indicated (1) in all cases of simple glaucoma; especially those in which the iris and anterior chamber are normal, for in these cases iridectomy is of no avail generally. (2) In cases in which an iridectomy has

failed. (3) In those cases of secondary glaucoma in which the iris is not adherent. In one case of hæmorrhagic glaucoma the remedy was without avail. (Centrabl. f. Med. Wiss., June 10, 1876, p. 421.)

Dr. Lucius remarks that Dr. A. Weber in 1871 used calabar bean to diminish tension in a case of staphyloma. The effect was marked. A solution was dropped in daily every hour till the tension was diminished. The staphyloma disappeared. It was then used in cases of deep ulceration of the cornea where perforation was dreaded, with great success. In 1873 it was used in glaucoma, and again in 1874. In the latter case the cure has been permanent. If the iris is affected it is not advisable to use calabar in ulcers of the cornea. In glaucoma absolutum, when operation was refused, the pain was relieved. In a case of staphyloma under treatment the tension diminishes towards evening under use of the calabar, and increases again in the morning. The staphyloma is diminishing. (Centrabl. f. Med. Wiss., Aug. 12, 1876, p. 581.)

Sparkling synchysis.—Dr. F. Poncet examined the eyes of a man, aged 42, who came under care three months after he first noticed occasional clouds before the eyes. Sparkling synchysis was detected in both eyes, and slight atrophy of the choroid in one. His vision was almost normal at times. He died of pyæmia after an operation on the scrotum, and the eyes were then obtained. He found crystals of cholestearine and of tyrosine and cellular elements, partly free and partly encrusted with phosphates. There were also separate globular collections of phosphates. Figures of these are given, and the literature of the subject discussed. The changes found pointed to fatty degeneration of the vitreous. The cellular elements were pigmented, and the author considered the pigment could only have come from the choroid. When migrated into the vitreous they might act as foreign bodies, and set up inflammation in the new elements (or old) in the vitreous. (Annales d'Oculistique, Mai-Juin, 1876, p. 255.)

Cysticercus in the Vitreous.—A case is recorded by Dr. Wecker (Annales d'Oculistique, Mars-Avril, 1876, p. 147). The patient was a man aged 22. He had noticed his left eye failing about six months, and he attributed the failure to overwork. His V. = $\frac{1}{50}$. A very definite opacity could be seen in the posterior part of the vitreous, and there was a yellowish reflection from the neighbourhood of the macula lutea. Between this highly reflecting surface and the disc was a detachment of the retina. Below and inwards was a bluish, transparent vesicle, recognised as a cysticercus. It did not change its position much. An attempt was made to perforate the cysticercus through the sclerotic with a Graefe's knife, but was not successful. The sclerotic was then laid bare at the outer side, an incision made

through it, and the cyst extracted after some trouble, but with exceedingly little escape of vitreous. Before the operation the symptoms of irritation of the vitreous were increasing rapidly. The result was surprising. Very little irritation followed. The eye was kept covered for a fortnight. He could count fingers with difficulty. Externally the eye had a normal appearance.

Vascular protrusion of both Eyeballs, most probably from arterio-venous communication in the Cavernous Sinus—Total Blindness—Ligation of the left common Carotid—Recovery.—Dr. Emil Gruening records the case of a married woman, æt. 59. Ten weeks previously she had received an injury to the head in a fall downstairs. On the fourth or fifth day after the accident the patient noticed a faint noise in the head, which gradually increased. She found that the left eye squinted inwards and protruded. A day later the other began to bulge. On ophthalmoscopic examination each disc presented the appearances known as “choked disc,” and in the left there were hæmorrhages. A loud bruit could be heard. It was stopped by pressure on the left carotid, and checked by pressure on the right carotid. The pressure on the left could not be borne for long without causing dizziness, faintness, or even complete syncope. Pressure was tried at intervals for a week. She was then lost sight of for a fortnight, when she was again seen, with all her symptoms aggravated and entirely blind. Several days later the left carotid was tied. Very soon afterwards the patient exclaimed that she could again see. The bruit quite disappeared, and did not return. The eyes gradually regained motive power, the hæmorrhages disappeared, and the vision of the right eye became good, whilst that of the left improved. The author refers to the statistics collected by Dr. Morton (*Am. Jour. Med. Sci.*, April, 1865, and July, 1870), and Dr. Henry Noyes (*New York Medical Journal*, March, 1869). (In the *Periscope*, Vol. viii, pp. 112–119, and p. 380, we have given abstracts of various cases, and we may also refer to a paper on Pulsating Tumour of the Orbit, by Mr. Walter Rivington, in the *Med. Chir. Trans.*, Vol. lviii, 1875. Notes of about seventy-five cases are given, forty-one being of traumatic origin.)

The Minute Structure of the Choroid.—Dr. Hubert Sattler contributes a paper (*Graefe's Archiv.*, Bd. xxii, Abth. ii, p. 1–100) on the anatomy of the choroid. He describes the different layers and their modifications in the ciliary region. Most internally is the vitreous lamella, or basement membrane. Under a low power it appears homogeneous, but under higher powers a lattice work becomes visible on its outer aspect; then follows the capillary layer; next to this a continuous endoepithelial layer, with oval pale nuclei, like those in the supra-choroidea; then follows a network of delicate elastic fibres arranged in several layers with the small arteries and smaller and medium sized veins; next comes another endoepithelial layer, and upon this is a coarser

elastic network with numerous pigmented cells; outside this are the branches of the larger vessels; and finally, the numerous lamellæ of the supra-choroidea. The structure is traced in the fœtus as well as in the adult, and in the lower animals. He also discusses the histology of inflammation of the choroid.

The cause of the Cherry-red Spot at the Macula observed in many affections—Dr. Hugo Magnus maintains that the cherry-red spot so often seen at the macula in cases of hæmorrhage into the optic nerve and in embolism is clearly not due to any disease at the macula, but to the fact that the macula remains transparent whilst the surrounding parts are opaque. If the nerve layer is rendered less transparent, and this often occurs, the yellow spot must remain unaffected, as the fibres are absent there. The opacity will conceal the choroid anywhere except at the macula. He details a case of detachment of the retina which he watched for some time, and in which the parts surrounding the macula became affected, whilst the macula itself remained intact, and showed the bright cherry-red spot. (*Zehend. Monatsbl.*, xiv, Mai, p. 145–152.)

Atrophy of the Choroid and its relation to Enlargement of the Eyeball.—Dr. Wilhelm Goldzieher is of opinion that atrophy of the choroid and of its vessels in certain parts may lead to congestion at other parts by collateral circulation, and thus to hydrops bulbi, and enlargement. (*Centralblatt f. Med. Wiss.*, Dec. 4, 1875.)

Detachment of the Retina caused by a medicinal dose of Whisky.—Dr. H. Knapp records the case of a man, aged 64, who came under his care with a detachment of the lower half of the retina in the right eye. The man had always been myopic, but had had good vision till six weeks previously. At that time he was troubled with diarrhœa, and to check it he took a glass of strong whisky. Immediately afterwards he noticed the sight of the right eye became very dim. He was a temperate man, and said he never took strong spirits except to relieve some temporary ailment. Dr. Knapp remarks: though in the prophylactic treatment of progressive near-sightedness or advanced posterior staphyloma we never fail to caution our patients against the abuse of stimulants, the above case is a striking example that in this affection even a single large dose of alcoholic liquor may lead to disastrous consequences. (*Archives of Ophthalm. and Otol.*, Vol. v, No. 1, p. 32).

Treatment of Detachment of the Retina.—Dr. Samelsohn advocates the application of a compressive bandage over the affected eye whilst the patient maintains the recumbent position; the other eye is protected from the light. The bandage should be removed and applied twice daily, and continued for three or four weeks. It is necessary to employ both rest in the horizontal position and compression. His experience of the treatment extends over twelve cases. (*Centralblatt f. Med. Wiss.*, Nov. 13, 1875.)

Retinal Changes in Progressive Pernicious Anæmia.—Professor W. Manz contributes a short note to the *Centralblatt f. Med. Wiss.*, Sept. 11, 1875, on changes met with in the retina in progressive pernicious anæmia. In a case he examined during life, he was struck with the colour of the “extravasations” which he saw. They were not of the bright red tint often seen in the retina, but of a dirty reddish brown. The larger spots were near the disc and yellow spot, the smaller more peripheral. The vessels seemed partially empty, they had broad light streaks, the finest arteries seemed, for the most part, white streaks bordered with thin red lines; the larger veins, however, were of a remarkably deep red colour, and somewhat dilated. After death, examination showed most of the blood spots to be round, white in the centre, and possessed of a capsule. The contents consisted of small round cells containing nuclei or some finely granular protoplasm. Around the central portion lay colourless blood corpuscles, though mostly at a definite distance from the central body, and leaving a sort of clear space (ring) between them. The relation of the spots to the blood vessels was most interesting. The capillaries showed dilatations here and there; in places these were lateral (sacculated), in others fusiform. They were either empty or contained formed elements: white or red blood cells, or a finely granular substance, hiding the cells. The larger blood-spots with thicker capsule had doubtless a similar origin; but their connexion with the vessels could not be traced. They might either be actual dilatations or diverticula of the vessels, or of their peri-vascular spaces. The extravasations in the retina in pernicious anæmia resemble therefore the so-called capillary apoplexies of the brain. There may be no extravasations of blood, merely aneurismal dilatation of capillaries. The retina should therefore be carefully examined after death in every case of pernicious anæmia, even though the ophthalmoscopic examination should have not revealed extravasations.

Microscopic Examination in a Case of Albuminuric Neuro-Retinitis.—Dr. Treitel gives the history of a patient who died with albuminuric retinitis, &c., and whose eyes were examined ophthalmoscopically and with the microscope. There were few hæmorrhages, but many white patches, and some highly refracting spots resembling cholestearine. On microscopic examination, no evidence of cholestearine was obtained. A curious stalked body was observed in connection with one optic disc. Numerous corpora amylacea were found amongst atrophied nerve tissue, and their histology is detailed. The author supports Leber’s views as to the presence of a capsule, and the origin of the bodies from nerve fibres. (*Graefe’s Archives*, Bd. xxii, Abth. ii, pp. 204–222.)

Peculiar Conformation of the Optic Disc in an Atrophied Globe.—Dr. Treitel records the examination of an atrophied globe removed for injury. The patient was a boy, aged 11. The eye had been

injured with a knife two years previously, and the globe was removed for sympathetic iritis of the other eye. The optic disc was found to project one and a half millimetres (about $\frac{1}{16}$ "') beyond the choroid. A figure is given showing a section through the disc; fig. 2, plate 2. (Graefe's Archives, Bd. ii, Abth. ii, p. 223.)

Tumour of the Optic Nerve.—Dr. M. Reich records the following:—A lad, aged 12, came under care with dilatation of the right pupil, a greyish yellow reflex being afforded by the deeper structures. It was supposed that the retina was elevated by a growth, and the eyeball was excised. On section a tumour was found in the optic nerve close to the eyeball, the retina was detached, &c. The growth was between the nerve substance and the sclerotic sheath. It showed numerous almost homogeneous, hyaline, tolerably thick, moderately refracting cylindrical bands or strings, some of which were cut parallel to their axes, some obliquely, and a few transversely. These lay amongst connective tissue, which completely filled up the intervaginal space. In a section across the nerve, these bands seemed roundish structures, or nodes of varying size surrounding the optic nerve on all sides. There seemed no trace of nerve fibres in the nerve. The bands, when more highly magnified, consisted of cells and finely granular masses lying amongst the bundles of fibres of the sclerotic. The cells were of an epithelioid type. Probably after existing some time, and partly under the influence of pressure and deficient nutrition, they were converted into the granular masses. In places the cells contained protoplasm, and the origin of the strings, &c., from the endothelial cells of the bands and fibres of the sclerotic and intervaginal space could be demonstrated. The tumour may be referred therefore to the group of pseudo-epitheliomata or endotheliomata. (Graefe's Archiv., Bd. xxii, Abth. i, p. 103.)

Ophthalmoscopic Conditions in Basilar Meningitis of Infants.—Dr. J. Hock contributes a paper on this subject to the Archives of Ophthalmology and Otology, Vol. v, No. 1, p. 60. No post mortem was obtained in either of his cases. The diagnosis was made by Dr. Monti. The changes in the nerves did not in any way resemble the "choked disc." There was no swelling, and therefore no "neuritis" properly speaking. He describes three conditions. A. The entrance of the optic nerve (inverted image) appears yellowish red, dull, lardaceous, the result, apparently, from examination in the upright image, of a delicate, crape-like opacity of the optic nerve fibres, leaving the central pit clear. The outlines of the disc are distinct, though not so sharply defined as in the normal condition; the level of the disc is not raised. The calibre and the course of the retinal arteries are perfectly normal; the retinal veins are dilated, darker, and more tortuous than usual, but remain in one plane, being uniformly visible in all

their parts. The part of the retina surrounding the optic disc appears somewhat opaque (much as the inner or upper margin of the optic disc sometimes appears in normal eyes). At a short distance from the disc, the fundus is perfectly clear and normal. *B.* By weak illumination, the fundus yields a dull, yellowish red reflex, as though a diffuse opacity of the refracting media were present; by strong illumination, this reflex varies from greyish yellow to grey. Corresponding to this condition, the optic disc and the retina, as far as the extreme periphery, are covered with an opacity through which the outlines of the disc can be distinctly recognised, but not the delicate details of the fundus. The optic disc is redder, but not raised; its vessels appear as in *A.* The veins of the retina, especially near the periphery, appear dark red, almost black. The lustrous waving retinal reflex is very marked, and accompanies the vessels to their smallest visible ramifications. The retina itself is grey, or blackish grey, in such a way that often nothing but the deep dark vessels and the accompanying retinal reflex are seen. *C.* (from a case of advanced meningitis in the stage of sopor). Colour and level of disc as in *A.* The retina around it is raised like a circular ridge, on which the blood-vessels ascend in curves. This ridge casts a shadow upon the area of the disc on that side which is turned from the light. The circular ridge is slightly opaque, totally different from the intensely opaque and red swelling in neuro-retinitis, and admits of recognising every part of the blood-vessels that pass over it. The opacity of the retina extends a short distance towards the periphery.

The author says that in placing these three conditions in the succession of *A, B, C*, he did not entertain the idea that the last-described condition was only a farther developed stage of the same affection, since he had repeated opportunities of observing the condition *A* in children during the last stage of meningitis; but he believes that these conditions, in the order in which they are placed, represent diseases of less or greater importance, for the morbid process in *A* is limited to a small portion of the background of the eye, and has changed the affected parts but little, whereas the conditions in *B* and *C* show more extensive and more important alterations.

Right-sided Binocular Hemipopia—Right Hemiplegia—Choked Disc on Left Side—Tumour of Left Posterior Lobe and Softening of Optic Thalamus, &c.—History of Syphilis.—The case is recorded by Dr. T. R. Pooley, with a view to prove semi-decussation of optic nerve-fibres. (Archives of Ophthal. and Otol., Vol. v, No. 2, p. 148.)

Semi-decussation of the Optic Nerves in the Chiasma.—Hirschberg (Virchow's Archives, Bd. lxxv, p. 116) narrates a case which he considers favours the view of the semi-decussation of the optic nerves in the chiasma. A man, aged 60, had left-

sided frontal headache for four years. Then he had hemiopia for a fortnight, at the end of which time he died. The hemiopia affected the right half of each field, was complete, symmetrical, sharply limited close to the yellow spot, the line of demarcation being vertical. A tumour was found in the left frontal lobe. The left optic tract was much thinner than the right. The tumour was a glio-sarcoma. (Zehend. Klin. Monat., xiv, Jan.-Feb., p. 54.)

Hemiopia and Optic Decussation.—Dr. Hirschberg records a case of right-sided hemiopia and gives a diagram of the field of vision. He is in favour of semi-decussation. The ophthalmoscopic conditions corresponded accurately with Mauthner's supposition. The right optic disc, which receives the fasciculus cruciatus of the paralysed left tract, was partially atrophied. The atrophy always first makes its appearance on the side next the yellow spot. (Archives of Ophthal. and Otol., Vol. v, No. 2, p. 188.)

Dr. Plenck also records a case of right-sided hemiopia, discusses the various forms of hemiopia which are met with, and gives diagrams of fields of vision. He points out fallacies which have to be guarded against before we really conclude that a patient has lost the temporal half of each field from an intracranial cause. He analyses the cases hitherto on record, and then passes on to nasal hemiopia. There seems reason to attribute the latter to local (ocular) disease, and not to any cerebral affection, or at any rate only indirectly. In right or left sided hemiopia the limit of the field in each eye generally forms a vertical line close to the point of fixation, but very various exceptions occur. He refers to Cohn's cases (see *Periscope*, Vol. viii, p. 374) and others. The variations may depend on the completeness of the paralysis of the optic tract. Dr. Plenck mentions a post mortem he saw in the case of a man who had lost his left eye twenty years previously. Both tracts were smaller than the right optic nerve, and the left nerve and right tract were particularly atrophied. A case of hemiopia with defect in the upper half of the field is narrated, and then the author sums up as follows: 1. Temporal hemiopia may be explained on the theory of semi-decussation quite as much as on that of total crossing. 2. The interpretation of right and left sided hemiopia offers many difficulties. The impairment of vision *per se*, but more particularly the accompanying appearances of paralysis, render the theory of total decussation highly improbable. "The latter conditions are more in favour of semi-decussation, for the exciting causes may be localised from the tract to the corpora quadrigemina and optic thalami, as has in reality been done from successful preparations obtained." 3. Those cases which have been described as *nasal* hemiopia, induced by pressure upon the posterior angle of the chiasma or by pressure of pathologically

changed arteries upon the outer borders of the chiasma, must be taken in the sense that the defects in the fields were caused by equilateral neuro-retinitis, independently of the central disease. The distribution of the nerve-fibres in the chiasma is not here brought at all into consideration. (Archives of Ophthal. and Otol., Vol. v, No. 2, pp. 191-220.)

Dr. Woinow makes a note on the eyes and brain of a woman who had lost the sight of her left eye in infancy. The right optic nerve was normal, the left atrophied; the left optic tract was markedly, the right moderately, atrophied. (Zehend. Klin. Monat., 1875, p. 424.)

Daltonism and Young's Theory of the Perception of Colours.—Dr. F. Rähلمان has a paper on this subject. His plan of testing the perception of colours has been described in the Archiv., Bd. xx, Abth. i, p. 250. He regulates the intensity of the different colours of the spectrum by means of a combination of Nicol's prisms. In the same paper he compared the sensitiveness of the periphery with that of the centre. He found that at a distance of 60° the periphery is nearly as sensitive to yellow as is the centre, six times less sensitive to green, three times less sensitive to blue, and four times less sensitive to red than the centre. In Bd. xxi, Abth. ii, he has investigated the perception to colours in affections of the optic nerve. He found that in such cases the perception of green was much diminished, more so than that of red and yellow; thus resembling the periphery of the normal eye. In the present paper he records several cases of colour blindness in persons who had good vision otherwise, and estimates their delicacy of perception of the different colours of the spectrum. He then discusses the bearing of Young's theory on these cases, and sums up to the effect that (1) in a large group, including cases of atrophy of the optic nerve, and certain cases of Daltonism without defect of sight, there is a change in the excitability of these nerve elements which normally permit of the recognition of green and violet. The curves which represent the degree of sensitiveness have their maxima displaced to the left towards the red. In this group the violet end of the spectrum is shortened. The older authors spoke of these cases as representing a want of perception of green. In another group (2), spoken of as blindness for red, the excitability of the nerve elements leading to the perception of red and green is altered in such a way that the fibres are adapted for more refrangible rays, so that the maxima of the curves for red and, in advanced cases, for green, are displaced towards the violet. Such cases are common, and he has formerly recorded such, but not in his present paper. In these cases the red end of the spectrum is shortened. (3) In another group, the rarest, the maxima of the curves of intensity correspond; both ends of the spectrum are shortened. (4) In the two first groups qualitative perception of light must depend on the admixture of

two fundamental colours, yellow and blue. The nerve fibres are only excited by rays of two degrees of refrangibility. In the third, qualitative perception is quite rudimentary, consisting only in a quantitative differentiation of shades of light. The nerve fibres are only excited by rays of one degree of refrangibility. (5) In the cases quoted the sensitiveness for certain colours is diminished, whilst that for others is normal or but slightly diminished. In some cases the sensitiveness for particular colours may be increased, whilst for others it may be diminished. Such cases do not differ essentially from those above mentioned; the ends of the spectrum are usually not shortened, however, but may on the contrary be lengthened. (Graefe's Archiv., Bd. xxii, Abth. i, p. 29.)

Perception of Colours.—Dr. Ricco has experimented by means of concentrating with an achromatic lens a beam of light in a darkened chamber on a portion of a rotating blackened disc, furnished with radiating slits one millimeter in width. At a convenient distance from the disc a white surface is placed, and in this may be seen a glimmering clear circle, and if we look steadfastly at this we shall see in the middle a lozenge-shaped variegated chequered patch, on which the least refractive colours, red, orange, and yellow predominate. At the circumference there is a small line made up of the more highly refrangible colours, blue, indigo, and violet. Entoptic shadows can also be perceived when a visiting card is rapidly rotated before the eye. He discusses the shadows thrown by the yellow spot and the lens, and the different sensibility of the eye for different colours of the spectrum. He throws a horizontal spectrum on a wall, and then looks at the image of it in a mirror made to oscillate in front of the wall. When the movement is slow the reflection of the spectrum is straight from end to end; but when the oscillation is more rapid the image seems bent at the yellow part of the spectrum, and both ends of the spectrum are bent backwards away from the wall, the violet is therefore considerably displaced. The image also widens steadily from the red to the violet. The image of the spectrum may be thrown on the wall, and may thus be seen by a number of observers at the same time. Other experiments are detailed. (Graefe's Archives, Bd. xxii, Abth. i, p. 282.)

The State of the Vision in the Deaf and Dumb.—Dr. Hans Adler (Zehend. Monatsbl., xiv, März-April.)

The Royal London
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and Journal of
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PART I.

Original Contributions.

CLINICAL GROUPS OF CASES OF AMAUROSIS.

By JONATHAN HUTCHINSON.

IN investigating the extremely complicated questions involved in the subject of amaurosis (using the term in a very wide sense, as embracing cases of atrophy of the optic nerves from all causes, as well as cases of blindness without visible change), it is most desirable to have a large material to work upon. Without in the least disparaging the importance of the minute study of individual cases, both in regard to life-history and pathological anatomy, we may, I think, make some use of our less complete records by throwing them together in large numbers, and attempting to subdivide them into classes in accordance with their leading clinical features.

Even a very moderate diligence in case-taking supplies, in the course of years, an accumulation of material which

rapidly becomes most unwieldy. The memory is taxed to the utmost to retain even the chief points of the more remarkable cases, and all details gradually slip from its grasp. The recurrence to note-books and re-perusal of manuscript is most laborious, and to many almost impossible of satisfactory accomplishment. Each succeeding day brings as much new matter as it is practicable to deal with, and thus that which has been collected in the past becomes but too often buried and forgotten. Yet it is only by the careful collation and comparison of cases that the art of clinical observation can advance. It has often occurred to me that in facing this difficulty, and source of loss to science, something might be done if observers would record their cases not in full, but in brief abstract. It is often possible, in a few lines, to sum up the chief facts which are recorded in many pages of manuscript, and give them, also, in a manner which shall, to those familiar with the subject, suffice for most purposes. Such records in abstract will often enable the author to classify his facts with tolerable correctness, and give the reader a good opportunity of estimating their character and significance.

By this plan, we also gain much security against the risk of overlooking important facts. With the whole material before us, we proceed, as a botanist would do with his dried specimens, to put into groups those of which the names are known, and then investigate more closely those which remain over. When this is done, it will frequently be evident that of the cases which remained peculiar or, perhaps, isolated, two or three closely correspond with each other, and thus, by degrees, groups are formed and natural affinities brought out. I make these remarks somewhat in the way of apology for bringing before the reader such a large collection of material, much of which may appear somewhat crude.

In the present paper short outlines only are given of a considerable number of cases of which I have long notes. Many of them are incomplete in one or more respects, but

none are included which did not seem full enough to be useful for purposes of comparison or confirmation.*

GROUP I. OPTIC NEURITIS FROM TUMOUR IN THE BRAIN.

In this group I have but six cases to mention, two of which I have already published in detail. In four of these the diagnosis of "tumour" as distinct from syphilis on the one hand, and tubercular meningitis on the other, was almost certain. In three, indeed, an autopsy was made. In Case 2, the diagnosis was less certain, and it is possible that it may have been an instance of recovery from tubercular meningitis and subsequent relapse.

Intense headache; neuritis, with "choked discs," and subsequently atrophy; absolute blindness, and dilated pupils; convulsions; frequently paralysis of other orbital nerves, or some degree of hemiplegia; such are the principal symptoms which occur in amaurosis from cerebral tumour. From tubercular meningitis, we may diagnose by the circumstance that the symptoms develop more gradually, are attended by far less constitutional disturbance, and are more protracted. The fact that no benefit accrues from treatment may help us to distinguish them from cases of syphilitic gummata. It is never safe when this suspicion is entertained to rely upon the absence of history of syphilis. Many warnings on this point have occurred to me, and so similar in many cases are the symptoms of tumour and those of gumma, that I would incline, in almost all cases, to let the patient have the chance of benefit which the trial of iodide of potassium in full doses affords. The neuritis which attends gumma rarely sets in with the same sudden-

* Those of the following cases which have been published before, may be identified by the references :—

M. C. T. = Medico Chirurgical Transactions.

L. H. R. = London Hospital Reports.

O. H. R. = Ophthalmic Hospital Reports.

The letter B refers to cases under care many years ago, for the most part prior to 1864.

ness and severity as that caused by tumour, and rarely results in such absolute blindness.

I have, of course, seen many other cases in which, with optic neuritis, tumour was suspected; but in most instances they have been transferred to my medical colleagues, or have remained under care only a short time.

Case 1. F. 202. Eliza D., 14. (Full details).

Double optic neuritis, with but slight defect of V.; and paresis of R. 6th nerve.

Previously severe headache. Subsequently severe headache and some fits, and stupor. Partial hemiplegia.

Death rather sudden about 3 years after commencement of symptoms, æt. 17. *P.m.*, two tumours, one at base of skull as large as a hazel nut and almost cartilaginous, much serous effusion, the other in optic thalamus.

Her father died of general paralysis of the insane æt. 38. At the *p.m.* "the usual appearances of that disease in the brain," the other organs healthy. A cousin idiotic, and other relations suffering from nervous disease.

Case 2. F. 281. Maria B., 11. (Full details).

Atrophy after neuritis, with absolute blindness, after an illness with cerebral symptoms; weakness, severe frontal headache, loss of appetite and sickness. *Ps.* partly dilated.

Later; nystagmus, another illness with fits, ending fatally at about æt. 12—13. *No p.m.*

Case 3. B. p. 42. Frances Montgomery, 24, single, came to me in June, 1862, totally blind with profuse neuritis. Her sight had begun to fail about 2 months previously, and had progressed to total blindness in about 6 weeks.

She remained totally blind, with wide pupils, which contracted a little when exposed to light.

She became feeble and nervous rather before the time when sight began to fail, and had to leave her place on account of weakness. She also became subject to severe headache at back of head, keeping her awake.

She was under care at the Metrop. Free Hosp. for 3—4 months and continued to get feebler and thinner, and still suffered from

much headache and some sickness. She had, however, no paralysis and no loss of sensation. She died just a year from the beginning of her symptoms. *No post mortem. Diagnosis, cerebellar tumour.*

Case 4. G. 171. Emma T., 9.

Paralysis of one 6th N., followed by optic neuritis of same, and later of other eye.

Probably tumour.

Case 5. O. H. R., v, 163. Mrs. W., æt. 36. (Full details.)

Neuritis as an accompaniment of other cerebral-nerve symptoms in a case of tumour of crus cerebri. Autopsy.

Case 6. O. H. R., v, 167. B. 267 and 382. Mary Anne A., 20.

Neuritis and almost complete amaurosis. Cerebral tumour diagnosed. No paralysis; very severe headaches; torpor; sluggish pupils; partial insanity.

(No notes of *p.m.*)

Case 7. Stephen W.

For a case of well marked neuritis from cerebral tumour, see that of Stephen Watson (Lond. Hosp., 1871, p. 306. Published in Brit. Med. Jour., Feb. 19, 1872).

GROUP II.—AMAUROSIS FROM OPTIC NEURITIS IN THE TERTIARY STAGE OF SYPHILIS.

The evidence of syphilis was not conclusive in all the cases which I have included in this group, but in all it was sufficient to warrant a tolerably confident suspicion. The group is an exceedingly important one, since the cases are frequent, and much may be done by treatment for the patient's benefit. Of the cases which ended in blindness, it was not known in any that efficient treatment had been resorted to in the neuritis period. The group comprises 21 cases. Two only were known to have died, and of these in one the diagnosis had been "cerebral tumour" and the treatment inefficient. I brought this important case (No. 16) before the notice of the Pathological Society,

and it is recorded in this year's volume of Transactions. In only one case (23), was the disease believed to have been inherited, a fact of much importance in reference to the rarity of all forms of cerebral syphilis in the subjects of hereditary taint. Even this single case was not an undoubted instance of cerebral gumma, although that diagnosis may be admitted to be very probable.

As regards sex, it is of interest to note that exactly half were women, or, including the hereditary case, 11 women to 10 men. As it is probable that many more men than women suffer from syphilis, this proportion is somewhat unexpected.

The cases included under the term "Cerebral Syphilis," must be divided into three or four different classes. 1st, those in which disease of the coats of arteries lead to thrombosis, or hæmorrhage; 2nd, those in which gummata of the meninges are present; 3rd, those in which disease of the bone exists; and 4th, those in which the changes implicate nerve-centres, but are attended rather by degeneration than growth; and lastly, perhaps, a group in which a travelling form of primary neuritis is present. I speak, of course, somewhat conjecturally in admitting the two last, but clinical facts support the probability. Of these five groups, it is probable that the 2nd supplies us with by far the larger proportion of amaurosis cases. The neuritis which occurs in the tertiary stage of syphilis, is usually secondary to gummata in the meninges. Arterial disease, with hæmorrhage or softening, may occasionally cause neuritis, but whilst arterial disease is, perhaps, the commonest form of "cerebral syphilis," we meet with it but rarely as a cause of defect of sight. I have not admitted into the present group any cases which obviously belong to the 4th or 5th classes, since I wish to reserve them for special consideration subsequently. It is possible, however, that Case 26 ought to have been reserved on this score, for the only symptoms of gumma or of bone disease were headaches, and there was no proof

of neuritis. In nearly all the others there was reason to suspect gummata, and in very few was there the history of the sudden attacks of paralysis which denote arterial disease. A glance through the cases will show that the neuritis which occurs with cerebral gumma varies a good deal in different cases as regards its symptoms and rate of development. In some (as in Cases 17 and 18), both eyes failed together, and rather rapidly; but in many others, the progress was more like that of Case 20, in which first one and then the other was affected, and progress, both as regards advance and cure, was gradual. Severe headache stands out in almost every case as the most conspicuous symptom, and with it we have usually giddiness and occasionally deafness, convulsions, paralysis of other nerves, &c. In one instance in which the history of symptoms in the patient was wholly wanting, the woman had borne a syphilitic child.

Cases 17 and 18 are examples of the rapidly-triumphant results of treatment, both patients having regained perfect vision in a few weeks under the use of the iodide. In Case 20, the result, although much more gradual in attainment, was scarcely less satisfactory. A large majority of the patients came under my care when the atrophy was established and treatment hopeless.

Case 8. G. 17. Thomas W., 50. Syphilis probable, but not proved.

Atrophy of discs and amaurosis, following neuritis.

History of numerous convulsive seizures without loss of consciousness, several years ago.

Subsequently sudden L. hemiplegia, and death in about a month. No *p.m.*

Case 9. G. 56. Mrs. P., 39.

Double recent optic neuritis and white dots with hæmorrhages, with absolute blindness. Blindness coming on suddenly during or directly after a fit, 3 weeks ago.

History of sickness and headache for several months before the fit.

Note 4 years later; blindness permanent; has had another fit.

No history of syphilis, but of a node on forehead following a blow had ulcerated and left a scar.

Case 10. G. 268. Isaac C., 44.

Failure of V. after 2 months of headache and sickness, for which he had to keep in bed. Failure rather rapid, and then remaining stationary at no p. l. till admitted about a year later.

Atrophy of discs and diminution of arteries, with remains of neuritis.

Some periosteal swellings on skull.

Probably neuritis from intracranial nodes or gummata.

Case 11. G. 87. Eliza D., 25, unmarried.

Atrophy of discs after neuritis, with much diminished vessels; absolute blindness of L. and shadows with R. No choroiditis. Ps. fairly active, but L. larger than R.

Failure of V. 5 months (Christmas, 1871), preceded for 6 months by severe pain in head and vomiting (June, 1871). That illness preceded immediately by "rheumatic fever" of 3 months' duration, with swelling and great pain in joints and limbs (? nodes) (spring of 1871). Scar of cellular node in neck.

History of severe secondary syphilis, with double iritis (synechiæ) at æt. 15, *i.e.*, 10 years before the cerebral symptoms and neuritis.

Case 12. F. 365. Charles H., 35.

Double optic neuritis with hæmorrhages. V., R. 16 J. L. 2 J. and $\frac{2}{2} \circ$.

Failure of V. about 4 months, preceded by intense headaches; paroxysms lasting a few hours and coming on every 2 or 3 days, relieved by lying down. They ceased after leeching the head, and had ceased when V. began to fail.

History of several attacks of giddiness and of a fit, several months before the headache began.

Probably had syphilis several years ago, but not proved.

Case 13. O. H. R., v, 109, B. 344. Mrs. A., 30.

Double optic neuritis, going on to all but complete blindness in about 12 months, preceded by sickness, and accompanied by severe headache.

Discs gray-white, quite flat, without much opacity. Vessels of fair size.

Syphilis fully from husband, 4 years before failure of V.

"For years" subject to pain in occiput, giddiness and noises in ears.

At one time had weakness of L. limbs.

Loss of smell occurred with the amaurosis. Hearing perfect.

Case 14. B. 192. Mrs. H. S., 31 (1864).

Neuritis (no great amount of opaque effusion) and extreme defect of sight in a woman, the subject of tertiary syphilis, and who had suffered severely for the last 8 years from nodes on the skull and legs, and from various symptoms depending on affection of nerves of special sense. Taste, smell, sight, and hearing, all more or less affected about the same time. Failure of sight varied on different days. Accompanied by intense headache.

No note of progress.

Case 15. B. 46. Charles W., 29.

1855 or 1856. Had chancre and rash.

1858. A six weeks' illness, with much pain in forehead and eyes, and repeated vomiting. Then had diplopia, soon followed by failure of V., first in one eye, then the other. V. became worse during a salivating course of mercury. Also took iodide largely, without getting better or worse.

1860. Under me for first time. R. eye diverged rather. Ps. active; R. rather larger than L. V. about 20 J.

1862, æt. 29. Atrophy of *o.ds.*, with partial absorption of choroid near them; in the R. this passes nearly to *y.s.* Edges of discs jagged; arteries small. V. about same; no worse. Ps. dilated, but freely movable.

1865. V. same. R. p. l.; L. barely 18 J. Ps. dilated and sluggish, but act a little. Health good. No other syphilitic symptoms.

Case 16. B. 272 (and O. H. R., v, 170). Eliza Jane T., 36.

Neuritis, with history of variations of sight, ending after a few months in total blindness of one eye and all but similar state of the other (occasionally sees shadows).

Preceded for a few months by severe pain in head and epileptic

fits (no tongue-biting), which have since become frequent; history of partial loss of intellect since the fits began.

Probable syphilis 4 years ago (scar-leaving rash).

Case 17. Mrs. B. See Pathol. Transactions, 1877.

Double optic neuritis, with intense headaches and partial amaurosis. Recovery of fair V.

Four years later, relapse of the very intense headaches, but no failure of V. Temporary aphasia, and afterwards weakness of R. side.

Death. Gummata of dura mater, and thickening of this membrane, and condensation of bones of skull.

Syphilis certain, but the date unknown.

Case 18. Mr. M., about 30.

Double optic neuritis with almost complete amaurosis and intense headaches. Rapid recovery of perfect V. under use of iodide.

Syphilis, with very prolonged secondary and intermediate symptoms, about 12 years before the neuritis.

Since his recovery from the neuritis now five years ago, Mr. M. has often been under my care for headaches, giddiness, &c., and is always cured by the iodide. He has had no relapse of neuritis, and now sees perfectly.

Case 19. Mr. T. had syphilis probably about 15 years before I saw him, on May 1st, 1874.

He had then been failing in health for some months, the chief complaint being a sense of faintness, and pain in the back of the head and neck, "a dull steady pain." There had also been shooting pains in the limbs. When I saw him his sight was very defective, and there was neuritis.

After a short course of iodide, the discs cleared all but perfectly, and he regained perfect vision.

Case 20. Edward J., 31.

Double optic neuritis, with gradual failure of V. for several months. Recovery of nearly perfect V. while taking iodide (but taking it irregularly).

Node in thigh and syphilitic ulcers of legs during the neuritis.

No note of head symptoms.

Case 21. Mr. R. G. W., æt. 36.

Optic neuritis of L., followed by same condition in R. after a considerable (?) interval.

Partial atrophy of L., resulting in a condition very like that from tobacco, but with great defect of V.

He had had syphilis, with prolonged secondary stage, 15 years before the neuritis. He suffered at the date of the neuritis from giddiness, ringing in ears and headache. He recovered under treatment.

Case 22. Edward Q., 35.

Atrophy of discs with amaurosis of 4 years' duration. Failure rapid, in one week.

Opaque white discs, with slight haze of edges, and some notching. Arteries diminished.

Possible syphilis 12 years ago.

Case 23. Lond. Hosp., 1871, p. 23. Sarah B., 44.

In the Hospital for superficial lupus of face (8 years' duration), with scarcely any ulceration ("Bat's wing"), February 17, 1871.

She also had white atrophy of discs with some (but not extreme) diminution of retinal arteries; the margins of the discs were irregular, as if from former neuritis. (There is unfortunately no note of her vision, but from other statements it is probable that she could see fairly.)

Fifteen years ago she lost dead bone from her nose and from the roof of her mouth. This was followed about 2 years later by what she calls "St. Vitus's dance," and soon after by double vision and dimness of sight. The sight got better, but she next had partial paralysis of the left side; a permanent and indeed increasing weakness of left leg has resulted, and she now cannot walk without a stick. She also gives the history of an illness attended by 6 weeks' loss of consciousness; this was a few months after the paralysis of left side. Her entire train of nervous symptoms would appear to have come on within about 1 year or 1½ year. She was under the care of Mr. Bowman and Dr. Todd, and was afterwards at St. Thomas's Hospital.

Married 19 years (4 years before the necrosis); 2 pregnancies, both ending in still births.

Case 24. Neuritis ending in total Blindness in one Eye, and all but complete Blindness in the other, during Pregnancy, in a Young Woman, suspected to be the subject of Inherited Syphilis.

Lond. Hosp. 1871, p. 254. Hannah T., 22, married.

For 12 months past had been subject to fits, with loss of consciousness. The first occurred when she was 6 months pregnant, and sight began to fail soon after it. *She was unconscious for 3 days.* Very numerous fits since then, sometimes 3 in a week. The fits often preceded by excessively severe frontal headache, generally beginning in the morning, and accompanied by vomiting. The headaches sometimes prevent her from recognising people. She often cries out with the pain, and cannot keep her head still. Her fingers and feet "seem to be all on the work" before she has a fit. The headache generally culminates in a fit, and is relieved afterwards.

She has had many cellular and some periosteal nodes. Her aspect and teeth are not quite typical. Iodide relieved the pain and cured the fits during the 10 months that she was under care, but sight remained just the same. The discs cleared, and became almost clean, but they were much atrophied, and she remained nearly blind.

It is possible that the symptoms may have been related to pregnancy. Her urine contained no albumen. (Full details).

Case 25. Neuritis accompanied by Paralysis of both 6th Nerves, one 4th Nerve (?), superior and internal branches of one 3rd, and the iridal fibres only of the other 3rd Nerve—Tertiary Syphilis probable.

Lond. Hosp. 1871, p. 339. Elizabeth F., 42, a married woman, began to suffer from pain in the head (chiefly nocturnal), accompanied almost from its commencement by dimness of sight and by some muscular defect of the L. eye, causing it to "turn up."

She came to Moorfields 3 months after these symptoms began, and was admitted as an in-patient, but there are no notes of progress. Her optic discs were then pale, and showed remains of neuritic exudation.

It is probable that she and her husband had syphilis 12 years previously. 3 children had been born prior to the date of her (admitted) venereal disease; all are living and well. Of

6 born since, only the youngest is living, 3 of the number having died within 3 months of birth, and 2 within 2 years old; all these 6 had "thrush."

Case 26. G. 225. Mrs. T., 35.

Failure of R. about 8 years.

„ L. „ 3—4 years.

Advanced atrophy of R., but with still some swelling and remains of lymph.

Neuritis passing to atrophy in L.

Ps.—L. very small; R. larger and motionless to light.

She has borne many dead fœtuses, and her only living child is very markedly syphilitic, and also has defective sight in one eye from opacity in the vitreous, and some pallor of discs. No direct evidence of syphilis in the patient.

Case 27. C. 70. Mrs. C., 27. Symmetrical failure of sight, without ocular changes. ? Descending neuritis. Syphilis rather severely seven years ago. No reminders until six months ago, when severe headaches began. No other cerebral symptoms. Discs at first normal, but artery small. Under observation 1 month, and the discs got a very little paler. Snellen 70 at 1 foot.

Case 28. F. 49. Thomas K., 55.

Gradual failure during about $1\frac{1}{2}$ year, down to 19 or 20 J. with R. and p. l. with L. He had some giddiness, and for a time "dreadful" headaches, sometimes making him delirious; was out of his mind ("stupid") for a short time, 2—3 years after failure of V. V. began to fail about æt. 47.

Æt. 51. Discs atrophied, and some doubtful haze from former neuritis. Arteries not diminished materially. Ps. normal size, but motionless.

Æt. 55. Discs same; more atrophied on y.s. sides. White lines along vessels. Neuritis doubtful.

Health good. No paralysis. No headache now. Occasional numbness of L. upper extremity.

Syphilis denied, but probably the cause. History of sudden deaths on father's side.

GROUP III.—NEURITIS WITH CEREBRAL ILLNESS IN CHILDREN ENDING IN PERFECT RECOVERY OF HEALTH.

Tubercular meningitis is a common cause of optic neuritis, but the cases usually end fatally, and do not proceed to that stage to which the term amaurosis is applicable. In a certain number, however, after a severe attack of cerebral symptoms, the child recovers, and on recovery is found to be blind. Of these a considerable proportion find their way to ophthalmic surgeons. It is of such cases that the following group is composed. It is possible that in some, the diagnosis of tubercular meningitis could not be sustained, and that they ought, rather, to be regarded as examples of arachnitis at the base of the brain, implicating chiefly the sub-arachnoid spaces. The precise nature of the primary lesion must be left in doubt. The fact, however, remains, that a large number of such patients recover and regain excellent health, remaining usually quite blind. Now and then, after long periods of blindness, slow improvement sets in, whilst in a small minority fatal relapses of cerebral symptoms occur.

I wrote a paper on this subject, and recorded a series of cases in this Journal (vol. v, p. 310), some years ago. Most of these cases are briefly referred to again in the following list. It is possible that in some of the cases the disease may have been of the nature of cerebro-spinal meningitis, and in others it is probable that the head-symptoms were in association with one or other of the exanthemata.

Case 29. C. 208, William W., 7.

Gradual failure of V. for 6 months, without headache or sickness.

Six months after it began, neuritis of each disc passing into atrophy, with choroidal atrophy at *y.s.*, "as in the other cases,"

Ps. of usual size and fairly active.

Case 30. O. H. R., v, 311, C. 125. Mary C., 6½.

Amaurosis with atrophy of discs; some haze, and much diminution of arteries and veins. Changes more advanced in L. than R.

In L. also, minute white dots in choroid or retina, chiefly in a group near *y.s.* Some slightly pigmented.

L. believed to have been as bad as now since *æt.* 12 months.

R. failing only 2 weeks, according to statement.

Case incomplete.—? Heredito-syph. choroido-neuro-retinitis.

Case 31. B. 372. Alfred H., 3½; and his mother.

Failure of sight 2—4 weeks, after a severe illness of 2—3 weeks' duration, called "fever," (probably typhoid, for a sister had similar symptoms at same time, but her sight did not fail); vomiting, diarrhoea, headache, and emaciation; then rapid convalescence and failure of sight.

Neuritis, with pallor and swelling; symmetrical. Vessels of retina much diminished.

Ten years later (*æt.* 14). *February*, 1876. Has had excellent health, and been free from headache ever since the illness. Just sees 16 J.; sight has slowly improved since last attendance. Discs very white, but vessels not extremely diminished; edges considerably notched, and not quite clear; vessels moderately diminished. Clear evidence of past neuritis. No change since last seen at *æt.* 8 and *æt.* 4. Well grown and fairly intelligent. Still subject to occasional bad headache. Forehead rather square.

His mother is now found to have atrophy of her R. disc; it has been imperfect since she was 24. It shows no evidence of neuritis, and perhaps failed in connection with nervous headaches.

The eye diverges. V. 20 J, but field of V. much contracted. *o.d.* gray-white, clean and even; no signs of past neuritis. Vessels little, if at all diminished.

Believes it failed quickly in connexion with a severe inflammatory attack ("cold") before marriage. The eye was painful and bloodshot, and she was cupped for it. ? Erysipelas.

No other family history of bad sight.

Case 32. O. H. R., v, 311 (and B. 178), Case 4. Robert L., 1 year.

Neuritis (hazy discs and small arteries), with apparently complete blindness.

Supposed to have been blind some months, since having "fits" with teething. Ps. moderate size, and dilate well with atropine.

Discs subsequently cleared, and were not left very pale; arteries remained small.

V. improved decidedly during nearly a year.

No evidence of hereditary syphilis.

Case 33. O. H. R., v, 310 (and B. 173), Case 3. Louisa Butler, 12.

Neuritis, with woolly swollen discs, and total blindness. Blindness permanent (notes 2—3 years later).

History. Severe illness, with great pain in head, vomiting and delirium, loss of power over sphincters, and weakness of legs. Complete recovery in about 6 weeks.

Rapid failure of V. towards end of recovery from illness (*i.e.*, about 6 weeks after illness began).

Ps. wide and fixed. Paresis of R., int. rectus.

Probably a case in which neuritis did not cause damage to V. until it had been present for some weeks.

No note of the treatment adopted in the illness.

Case 34. B. 3. Esther E., 8. September, 1861.

Ten months ago had "gastric fever" for 1 month. Not very ill; no vomiting, and little headache. Dull and stupid, not delirious.

At end of month sudden loss of sight. Had had diplopia and squinting shortly before, and eyes said to have been very prominent.

Blue-white atrophy, and much diminished vessels.

Ps. normal size; act very little.

Is pale.

Case 35. F. 291. George M., 3½.

Amaurosis, with atrophy after neuritis (still passing off), after a cerebral illness; vomiting, severe headache, constipation, and feverishness; is said to have squinted. Was never so ill as to be kept in bed. Never became unconscious. No fits. Did not lose appetite. Has for long had a cough, and been "weak at the chest."

Ps. fairly active; eyes oscillate slightly.

A year later (æet. $4\frac{1}{2}$) Ps. still act, but sluggishly, and are habitually large. Still quite blind.

Case 36. F. 186. Annie E., 14.

Blue-white atrophy of discs, with shelving cups, but little or no diminution of vessels. No p.l.

Ps. large and fixed.

Blind since "brain-fever," with very severe headache, and great prostration at æt. 4.

Now in excellent health.

Case 37. F. 92, and O. H. R. VIII, 493. Jas. Thos. Acton, 9.

Atrophy, after neuritis following cerebral symptoms, with great defect of sight.

Condition, $4\frac{1}{2}$ years after the neuritis.

History of similar illness, ending fatally, in a brother.

Case 38. F. 68. Wm. Y., 14.

Advanced atrophy of discs, with evidence of past neuritis, viz., irregularity of choroid, and remains of lymph near disc. Arteries somewhat diminished. Refraction, Hy.

V., R. — cannot fix.

„ L. 12 J.

Failure of V. after a fit about 5 years ago; had convulsion of R. side of body.

Æt. 5 was operated on for convergent strabismus and for stone in the bladder by Mr. Hutchinson.

Case 39. G. 385. Thos. T., 27.

Atrophy of discs, without much diminution of retinal vessels; absolute blindness.

V. began to fail gradually during dropsy, after "scarlet fever," at æt. 10 or 12. The R. failed before the L. ? Was it albuminuric neuro-retinitis.

It was accompanied by very severe headache for some weeks. The head symptoms began the day after a hot bath during the dropsy.

The illness is said to have been without rash or bad throat, but was called scarlet fever by the doctor.

Case 40. G. 385. Jacob G., 24.

Atrophy of discs, with probable evidences of former neuritis; great defect of V. and constant oscillation.

Defect first noticed at æt. $3\frac{1}{2}$, when it was as now; this was immediately after whooping-cough at æt. 3.

There were no fits.

Strong and healthy ever since, and never subject to headaches.

Case 41. Probably a case of Tubercular Meningitis with Neuritis, after Whooping-Cough.

G. 320. Edward Golding, 3.

Failure of V. during or soon after whooping-cough. Was very ill with the whooping-cough, and so weak he could not stand for several months; bad pain at back of head; "one doctor thought water on the brain."

Gray-white atrophy of discs, without any positive evidence of neuritis. Vessels of good size. R. believed to be much more defective than L.

Doubtful choroidal changes near *o.ds*.

No alteration of manner or intelligence.

Subsequent doubtful improvement of L.

Enlarged glands under R. jaw.

Case 42. G. 271. F. H. C. S., $1\frac{3}{4}$ years.

Neuritis, followed by partial atrophy; temporary failure of V. for several months, followed by recovery.

The loss of V. accompanied a cerebral illness ("bilious attack"), with loss of power of walking, but with no enlargement of head. The illness began suddenly.

He had previously learned to walk well.

Some months after regaining his sight, he had again just managed to learn to walk.

Case 43. G. 70. Mary Anne A., 11.

Atrophy of discs after neuritis, and in R., near *y.s.*, some small spots of atrophy of choroid.

Amaurosis, nearly complete.

Failure of V. 2 years ago, with sickness and headache, after measles.

Case 44. C. 357. Henry M., 9.

Neuritis going on to atrophy (dirty-gray discs), and great defect (20 J.) coming on gradually during several months, and sooner in R. than L.

Failure, accompanied by convergent strabismus and diplopia.

Headache and retching during several months before admission. Never confined to bed.

Under care 9 months, and the strabismus passed off.

Mother probably remotely syphilitic, and has lost many children.

Case 45. C. 349. Hy. B..

"Cerebral fever," with pain in head and loss of use of limbs, followed by failure of V. *æt.* 8. Laid up a long time. Could not walk for some time.

Æt. 12. Well-marked atrophy of discs; V. $6\frac{1}{2}$ Sn. barely. Ps. not dilated.

Case 46. C. 296. Chas. B., 10.

Double neuritis (swollen woolly discs) and complete blindness; sight failing for 8 weeks.

Failure preceded and accompanied by severe frontal and circumorbital headache, and by attacks of pain in neck and spine as far as lumbar region. Pain coming on in attacks every two or three days, and accompanied by severe vomiting. Neck stiff.

? Cerebro-spinal meningitis.

Case 47. O. H. R., VI, p. 43. Ellen H., 11.

Neuritis following cerebral symptoms; convulsions, headache, ptosis.

Recovery of good health; 6 weeks later, blindness, with woolly discs.

Case 48. C. 73. Charlotte T., 7.

Atrophy after neuritis coming on during severe cerebro-spinal symptoms.

Blindness remaining 8 months later (perception of light).

Case 49. C. 19, O. H. R., V. 313. Case 8. Wm. F.

Neuritis passing into atrophy; amaurosis; no p.l. Ps. motionless, and R. much larger than L.

Coming on during a severe illness with fits and severe pain in head, 2—3 months before admission.

Weakness or inability to use the legs for a short time after the illness, but subsequent entire recovery of power.

*Case 50. C. 14. Chas. H., 11½.**

Neuritis, with an illness accompanied by paraplegia and insensibility: Blindness up to time of his death, 8 months after symptoms began.

Case 51. C. 16. Chas. S. W., 11.

Neuritis leading to blindness (permanent during the 6 months of his attendance), with pain in back of neck, but no head-symptoms.

Small-pox 3 months before sight failed.

Case 52. C. 35. Wm. Hy. F., 7.

Blindness, with atrophy (from neuritis), 4 months after failure of sight. Previous headache, but not severe. History of severe illness, "sore-throat fever," 8 months before admission.

* The three following have been published in vol. v, p. 309, &c., of these reports.

(To be continued.)

MISCELLANEOUS CASES.

BY JAMES E. ADAMS, F.R.C.S.,

*Surgeon to the London Hospital, Assistant-Surgeon to the Moorfields Hospital.*CASE I.—*Unusual form of Inflammation of the Eye occurring in a Gouty Patient.*

George B., æt. 53. Has frequently had rheumatic pains in his limbs, and has had five or six attacks of real gout, always affecting one or other great toe. Father and grandfather had gout—also a brother 10 years younger than himself. He is otherwise in good health, and does not drink. The following attacks have all been in the right eye, were all exactly alike, and passed away leaving no trace behind. They came on quite suddenly with great pain; the lids became œdematous (looking like an ordinary albuminuric œdema), and the ocular conjunctiva presented well-marked chemosis and slight redness. There was never a trace of iritis, his media remained clear, and V. normal. There was no evidence of scleritis as the red conjunctival vessels could be freely moved over the subjacent sclera which appeared to be normal in colour. The following are the dates of his attacks:—

No. 1, May, 1869. Treatment—Leeches; poppy fomentations; colchicum. Only attended once.

No. 2, January, 1870. Same treatment. Only attended once.

No. 3, September, 1870. Same treatment. Only attended once.

No. 4, March, 1871. Same treatment. Only attended once.

No. 5, February and March, 1873. Same treatment. Attended twice.

No. 6, November, 1873. Same treatment. Attended twice; much better on the 3rd day after taking medicine.

No. 7, November, 1875. Same treatment. Attended three times.

No. 8, November, 1876. Same treatment. This attack lasted rather longer than the others, and he attended 4 times, and he has not since presented himself.

CASE II.—*Paralysis of Left Third Nerve with remarkable Intermision, Relapse, and Recovery.*

On June 11th, 1876, a gentleman, æt. 32. in large practice as a dentist, consulted me, complaining of slight ptosis in the left eye, with diplopia. At this time there was no *visible* deviation of the globe, but a chart* showing the position of his false image, revealed crossed diplopia (or divergent strabismus) with the vertical meridian of the left eye inclined outwards, or rather remaining too vertical in the movements upwards and to right, inclined a little out in the movement straight up, and corresponding to the right eye in movements to the left. On a level with the horizontal meridian and below it, all objects were seen single. This diplopia could only be referred to paresis of the left superior rectus. By the 14th the ptosis was more complete, the deviation of the left was visible, and the double images much further apart, and in a few days more the paralysis of the third was complete, excepting those branches to the ciliary muscle and iris. $V. = \frac{2n}{20}$ and Ji in each. H.m. $\frac{1}{50}$.

There was a history of syphilis 10 years previously, apparently a slight attack. *Diagnosis*.—Gummatous tumour. *Treatment*.—Iodide of potassium in large doses, galvanism, and cold douche to lids.

At the end of a month he awoke one morning and found that he could open his eye, and that there was no longer any divergence or diplopia. This intermission lasted ten days, and then his symptoms gradually returned, reaching their former completeness in about 24 hours after the first recurrence of the diplopia. He became as bad as ever, and remained so for two months, when a gradual improvement commenced and went on to complete recovery. He is now (May, 1877) perfectly well, and attributes the improvement to the cold douche.

I can find no record of a similar train of symptoms in connection with paralysis of the third, or indeed of any other, nerve, and I would not have placed the case on record unless I were fully satisfied that the evidence was

* The chart should have been printed with the report of the case, but has been omitted in consequence of delay in going to press.

in all respects reliable; but here our patient was fully alive to the importance of every symptom, and accustomed to careful observation, and it is quite impossible to believe that such marked deviation of an eye could in any way be under the control of the will. To speculate on the possible causation of the intermission and relapse is idle, although a theory might be constructed to explain the unusual sequence of events.

A CASE OF GLYCOSURIC RETINITIS, WITH COMMENTS.

BY STEPHEN MACKENZIE, M.D.,

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THE case I am about to communicate, illustrative of one of the ocular lesions associated with diabetes mellitus, may I hope prove of interest to ophthalmic surgeons. The case has a twofold value—clinical and pathological. It is valuable clinically, as diabetes was detected from ophthalmoscopic changes. It is valuable pathologically from the careful histological examination of the tissues of the eye by Mr. Nettleship; the cases being very few where a microscopic examination has been made, and but little being known as to the immediate cause of the retinal changes.

It may not be amiss if I preface the case by a brief review of what is known concerning glycosuric retinitis, as it will serve to direct attention to the most important points. In doing this I shall have to draw largely from Professor Leber's article, "Ueber die Erkrankungen des Auges bei Diabetes mellitus," which appeared in v. Graefe's Archives in 1875.* Professor Leber has collected eighteen cases of this disease, and added another, examined with great care and minuteness by himself.

Glycosuric retinitis rarely occurs until diabetes has been in existence for a rather prolonged period. It is generally ushered in by a more or less sudden and partial loss of sight, generally one eye suffers before the other, but in most cases the two eyes are eventually attacked, though often with unequal severity. Sometimes sparks are seen before the eye or eyes, at other times dark spots or muscæ are complained of, whilst in some cases disturb-

* V. Graefe's Archiv für Ophthalmalogie, Band xxi, Abth. 3.

ance of the perception of colours is noticed. Pain does not appear to be of common occurrence. Patients usually have a succession of attacks of disturbed and limited vision, and between the attacks the sight may be in a great measure restored. In some cases the vision is almost completely lost in one or both eyes. On ophthalmoscopic examination the lens is usually observed to be quite transparent. The optic disc is sometimes found red, sometimes atrophic. The retina is generally cloudy; the vessels in many cases are distended and dilated, but in others, especially as regards the arteries, are smaller than natural. Scattered over the retina are apoplectic spots. These sometimes occur as round patches of various size, from large blots to punctiform ecchymoses; sometimes as linear streaks occurring in the course of the vessels; again at other times, as linear streaks running in a direction at right angles to the vessels. Sometimes the hæmorrhages are beneath the superficial layers of the retina, when the retinal vessels may be observed crossing the extravasation; at other times the hæmorrhages are superficial, and obscure the vessels. The hæmorrhages vary in tint according to their age. They often have a brownish-red hue. In addition to the hæmorrhages, white spots are seen scattered over the fundus. They are of various sizes and shapes. Sometimes they are of opaque whiteness, at other times they have a glistening appearance: those having the last character being generally smaller, and arranged in constellations. Such constellations are found grouped around the yellow spot, but are not limited to this situation. Occasionally longish white raised patches or folds, surmounted by retinal vessels, are seen. Some of the white patches are, doubtless, altered extravasations, for white patches are met with having red borders. Others would appear to be due to fatty degeneration of the retina. Though these appearances are seen with more or less clearness in most cases at some period of the disease, yet in other cases the details of the fundus are obscured by

opacities in the vitreous. Sometimes on examination nothing can be seen but a red reflex; sometimes floating films can be detected, having a red or brownish colour; at other times the vitreous is simply turbid and cloudy. These opacities of the vitreous are obviously due to hæmorrhages. They are found to occur coincidently with sudden limitations of the visual field, and they may be observed undergoing absorption.

The appearances in the retina are very like those met with in connection with Bright's disease. So close is the resemblance that some observers have passed them over as albuminuric changes, indicative of nephritis brought about by the diabetes. This opinion is favoured by the undoubted co-existence of albuminuria with glycosuria in the majority of the cases. Besides the presence of albumen, casts and blood have been found in the urine of some patients, who have, moreover, presented other evidences of Bright's disease, such as dropsy, hypertrophy of the heart, &c. Still, there remain a certain number of cases where it is expressly stated on competent authority, that there was no albuminuria. Thus in two cases recorded by Desmarres,* one by Noyes,† and one by Haltenhoff,‡ there was no albumen in the urine; in some of the cases the urine was examined repeatedly with care. In Noyes' case the amount of urea was on several occasions estimated and never found deficient. It thus seems clear that the changes are not necessarily of an albuminuric origin. In some of the cases the sugar had been noticed to almost or entirely disappear before the retinal affection was observed. What seems further to distinguish the intraocular changes in glycosuria from those met with in Bright's disease is the frequent complication of the former with

* *Traité théor. et pract. des mal. des yeux*. 2nd ed. Paris, 1858, t. iii, pp. 521—526.

† *Trans. Amer. Ophth. Soc.* 1869, pp. 71—75.

‡ *Retinitis hemorrhagica bei Diabetes Mellitus*. Zehend., *Klin. Monats.*, 1873, xi, s. 291—298. An abstract of this and other cases will be found in "Periscope," parts II and III of preceding volume.

hæmorrhages into the vitreous. These occur equally in the cases where the diabetes is, and where it is not, complicated by albuminuria. Hæmorrhages into the vitreous are of rare occurrence in pure cases of albuminuric retinitis, so far as I know. They appear to be frequent in glycosuric retinitis, and are recurrent.

As to the cause of the changes in the retina and vitreous, there remains a certain degree of obscurity. Prof. Leber, in discussing these, considers that they may be due in part to the diabetes, in part to nephritis caused by the latter, or to the two combined. But, as he says, how diabetes brings about the changes is quite unexplained, as moreover, is the cause of the retinal affection in Bright's disease itself. But we find in by far the majority of instances of retinal disease that they are associated with lesions of other organs or with altered blood conditions and disturbances of nutrition. From the analogy of Bright's disease, in cases where the lesion is not due to renal affection, one is led to look to other organs in search of an explanation. The brain and the heart suggest themselves as possibly at fault. As regards the brain, the retinal changes met with in diabetes differ from the neuritis or neuro-retinitis usually associated with cerebral disease. Cases are met with, it is true, where changes almost precisely like those encountered in albuminuria are associated with coarse lesions of the brain, such as tumour, &c., but these are rare. Still, there may be some connection between the diabetes and the retinitis. Either the brain lesion may be primary, and cause both the diabetes and the retinal affection; or, on the other hand, the diabetes may be primary and cause both the retinal and the cerebral affections. These different classes of cases Prof. Leber has, he thinks, been able to distinguish in connection with the affections of the optic nerve in diabetes. Encephalic lesions, thus, do not appear to explain all the cases, and we turn to the heart in search of a cause. In the published cases, though the details in the records on

this point are few, there is nothing to support the idea that the hæmorrhages are connected with any heart affection, as in some forms of hæmorrhagic retinitis. In my case, about to be related, there was no hypertrophy or other sign of cardiac disease. Failing to find any adequate cause for the retinal changes in any of the viscera, we are driven, as Prof. Leber says, to compare diabetes with other morbid conditions attended by a like alteration in the retina, such as Bright's disease, pernicious anæmia, hæmophilia, purpura, leucæmia, &c. In all of these diseases there is an undoubted alteration in the blood, and, in some at least, changes in the vessels, in consequence of which diapedesis of coloured corpuscles and transudation of abnormally constituted albuminous matters take place. Such alterations are not limited to the retina, but are generally found also in the brain, spinal cord, and many other parts of the body. Their wide distribution is evidence in favour of a common origin in a blood dyscrasia. Dr. Dickinson has discussed very ably* the relation between the changes he finds in the nervous centres, and which resemble the appearances seen in the retina and the glycosuria. I cannot help differing from his conclusions, however, for Dr. Dickinson regards the perivascular extravasations and erosions of nervous structures as the cause of the symptoms in diabetes. To my mind the whole evidence points to the changes in the nervous system as well as those in the retina and other organs, being due to an altered condition of the blood. If the retinal changes found in diabetes are not due to an antecedent brain lesion, but are dependent on the same cause as the latter, then the fact that glycosuric retinitis only occurs when diabetes has been some time in existence, becomes valuable as enabling us to correctly interpret the changes found in the nervous centres. From what we know of the other diseases where similar changes are found in the retina and

* Diseases of the Kidney. By W. Howship Dickinson, M.D. 1875.

in the nervous centres, such as pernicious anæmia,* hæmophilia,† purpura,‡ leuchæmia,§ ague,|| the alterations in the nervous centres and in the eyes would appear to be coincident, rather than the latter sequential to the former. I think, therefore, we may justly infer, that the perivascular hæmorrhages, extrusions, excavations, and atrophies are the consequences and not the causes of the altered condition of the blood—I do not say the glychæmia—and blood vessels incidental to diabetes.

The following is the case to which I wish to direct attention :—

A woman (A. R.), æt. 52, admitted under my care into the London Hospital, December 15, 1875. Married; had neither children nor miscarriages. With the exception of an abscess of her knee-joint at 18 years, had no important illness; but had been subject to frequent attacks of diarrhœa, and suffered from rheumatic pains. The menopause occurred three years before admission. Her mother died of “galloping consumption;” her father through a severe cold. She had a brother living, but delicate.

She gave a rather confused and contradictory account of her illness, most of the facts having to be elicited by direct questions. In this way it was gathered that about three months before coming to the hospital, she went one day to look at the clock, and found she could not see what time it was with the left eye, and only with great difficulty with the right. This was the first time she experienced any defect of sight. Not being able to see the clock properly, she took a book in her hand and tried to read. She quite failed to do so with the left, and could not read at all plainly with the right eye. Shortly after this, as her sight

* Immerman, *Deutsche Arch. f. klin. Med.*, 1874, xiii, 209–244. Manz. *Veränderungen in der Retina bei anæmia progres.* *Centralblatt. f. d. med. Wissensch.*, 1875, No. 40, s. 675.

† Wickham Legg. Report from Post Mortem Room, St. Barth. Hosp. Rep., 1875, p. 64. Author. *Med. Times and Gaz.*, March 10, 1877.

‡ *Rec. Union Med.*, 1870, No. 48. Author. *Med. Times and Gaz.*, March 3rd, 1877.

§ Poncet. *Arch. de Physiol. norm. et Path.*, 1874, p. 496, and most ophth. writers.

|| Author. *Retinal Hæmorrhages and Melanæmia as Symptoms of Ague.* *Med. Times and Gaz.*, June 23, 1877.

did not improve, she came to the Ophthalmic Department of the London Hospital, and was seen by Mr. Waren Tay. Mr. Tay found hæmorrhages into each vitreous, obscuring the view of the fundus. In the left this was so much the case that nothing could be seen but an indistinct large white patch in the situation of the disc, with angular processes passing from it. In the right the margin of the disc could be made out, and did not show evidences of neuritis. Near the disc, below and to its outer side (inverted image) was a patch of extravasation of considerable size. Other smaller hæmorrhages could also be seen, but no white spots or patches. On examining the urine (when brought subsequently) Mr. Tay found marked evidence of the presence of sugar. The woman's health was failing, and her sight became so bad that she could not find her way about. Treatment of the diabetes afforded her only chance of improvement, and she was transferred to my care as an in-patient. At this time she could not read the largest test-type, and could not easily count fingers held in front of the eyes, but could distinguish the checks on the coverlet of her bed.

On inquiry it was elicited that about 12 months before admission she experienced severe pain in her back, especially in the region of the right kidney, accompanied by great thirst. Shortly after this she noticed that she passed a large quantity of urine, more than a couple of quarts a day. Her appetite was good, but not ravenous. In this state she continued up to admission, gradually losing flesh and strength, especially towards the latter part of this period.

On admission I noted that the patient was of short stature (4 feet $9\frac{1}{2}$ inches), fairly nourished, yet somewhat wasted; weight 6 stone $10\frac{1}{2}$ lbs. Her hair was plentiful, of a dark brown, turning grey, eyes greyish brown, complexion florid, lips of good colour; tongue small and pointed, coated with silvery fur on dorsum, but red at tip and edges; teeth few, those remaining in good state of preservation. There were no abnormal physical signs in chest, except a hyper-resonant percussion note and prolonged expiration, denoting vesicular emphysema. Owing to the latter, the cardiac dulness was masked. The heart sounds were natural. Pulse small, but rather resistant, the sphygmograph indicating a slight increase of arterial tension. Hepatic dulness in the right mammary line commenced at lower margin of sixth rib.

and did not extend beyond the margin of the costal arch. Splenic dulness not increased. Abdomen soft and flaccid. There was slight œdema of the feet. Her temperature was almost invariably below the normal, being generally between 97° and 98°. She passed on an average 3,000 cub. cent. of urine daily (rather over 100 ozs.), the maximum quantity being 4,000 c.c. The urine was pale and clear, and always had an acid reaction. Its specific gravity varied between 1,034 and 1,040. It contained on an average from 10 to 12 per cent. of sugar, giving about 380 grammes as the total quantity of sugar excreted per diem. The quantity of sugar varied somewhat, and rose (to about, on an average, 400 grammes) when she had been in the hospital a short time, with a liberal dietary. The largest quantity of sugar passed in one day was 666 grammes. She passed about 34 grammes of urea per diem, a quantity considerably in excess of the proper amount for a person of her weight. Her urine always contained a *trace of albumen*—never more than a trace. I have no mention of the presence of casts, which may be accepted as evidence that there were none, for the urine, I believe, was examined on several occasions microscopically. When the patient came under my observation the lenses were quite transparent, but the fundus was so obscured by the vitreous hæmorrhages that but few details could be seen. Mr. Couper saw the patient about this period, and his description accords with that of Mr. Tay, and with what I with less certainty made out. Mr. Couper reported: “In the *right eye* there are two large floating films in the vitreous; from their reddish-brown tint they are obviously altered blood clot. The vitreous itself is fairly translucent, yet turbid enough to conceal nearly all details of the fundus. There can, however, be seen an opaque, whitish, linear projection into the vitreous, on which retinal vessels are visible, and to which one of the filmy floating webs is attached. *Left eye*: the vitreous has all the appearance of having had diffuse hæmorrhage into it. It absorbs light strongly. The only visible detail of fundus is a glistening white crescentic mark, on which no vessels are visible, and which appears to be near the disc, but which cannot be identified with it. No visible floating material in vitreous. Tension fairly normal.”

After being left on a mixed dietary for a week, her urine was tested hourly one day, for 14 consecutive hours, to ascertain the

period after ingestion at which the maximum amounts of sugar, urea, and water were excreted. It was found that the largest quantities of urine and sugar were passed at the third and fifth hours after a mixed meal, she having fasted 14 hours previously to this. At the third hour the quantity of urine was 250 c.c., and the sugar 31 grammes; at the fourth hour the urine fell to 80 c.c., and the sugar to 9 grammes; and at the fifth hour the urine rose to 200 c.c., and the sugar to 25 grammes. The urea did not follow so exactly the rise and fall of the urine and sugar, as it frequently does in diabetes; she passed about a gramme of urea an hour. At the eleventh hour after food there was a marked rise in the amount of urine, of sugar, and of urea, the latter reaching its maximum for the day—2.1 grammes in the hour.

On January 6th all starchy and saccharine substances were removed from her dietary, and she was ordered gluten bread, green vegetables, two eggs, four pints of milk, and three ounces of whisky per diem. A week later she said she felt better—not so sinking as she had previously felt; her thirst was less; she did not perspire; she had an acid taste in her mouth.

On January 31st, 1876, whilst still on an almost purely nitrogenous diet, she was ordered a grain and a half of carbolic acid, in a pill, three times a day; and on February 14th the dose was increased to two grains. During this period her general condition improved; her thirst was less; and she passed, if anything, rather less urine and sugar; the quantity of the latter daily excreted was about 250–260 grammes. Her weight increased from 6 stone 10½ lbs. to 7 stone 7½ lbs., which latter was reached at the end of February. From this time her weight decreased, and it will be seen that untoward symptoms made their appearance coincidently with this. There was no material change in the various constituents of the urine, which contained much sugar and a trace of albumen to the end.

Her appetite was never excessive; she never had diaphoresis. On February 17th she complained of shooting pains in her legs. On March 13th it was noted she had not been so well the last two days. Her face was flushed, though her temperature was slightly below normal. She slept badly; had fallen off in her appetite. She complained of “rheumatics” in her knees and ankles. On March 15th she felt weak and giddy, and could not stand. She vomited once; cared for no food. The carbolic acid was discon-

tinued, and a stomachic ordered. On March 22nd she drew the attention of Mr. Williamson, the house physician, to a twitching of the right leg, which she said had been going on for nearly a week. At my visit, the next day, she was lying in bed, with a very flushed face. The latter had a bright red congestive look, like a very rosy apple, and the redness was most marked over the natural prominences of the face, such as the nose, cheeks, and chin. Her tongue was coated with a whitish fur, and she complained of thirst. Her urine was noticed on this day to have a smoky tint, suggestive rather of carbolic acid poisoning than of hæmaturia. She had not taken any carbolic acid since the 15th, however, and this was the first occasion that the urine had presented this appearance. It had not a peculiar smell. There was a convulsive twitching of the muscles of the right leg and foot, by which the latter was extended and adducted by a succession of discontinuous spasms. She had pain in this leg and tenderness on pressure over the tibia. There was slight twitching of the left leg, but no pain or tenderness. There was slight pitting on pressure over both feet. Mr. Tay examined the eyes ophthalmoscopically on this day. He noted there was a "red reflex from all parts of the right fundus, except an undefined white patch in the region of the disc. The left fundus gives no reflex whatever—looks quite dark. Pupils (as usual, I may add) only moderately dilated." Up to the time of her taking to her bed, she had been able to make her way about the ward, more by the exercise of her senses of feeling and hearing than by sight. It is curious to contrast Mr. Tay's observation with the following statement of the patient on this day. She said she always felt as if there was a black hat over both eyes when she looks upwards, not when she looks forwards. When the left eye is closed she still sees the black hat, but when the right eye is closed the hat disappears, and she sees fairly well. She was ordered a mixture containing 15 grains of bromide of potassium and half a drachm of aromatic spirits of ammonia, in water, three times a day. Her condition remained stationary for the next few days; she had the flushed face and twitching of right leg.

On the 29th of March, Mr. Williamson was called to the patient at 6.30 a.m. The sister said that at 5 a.m. the patient became almost insensible very suddenly. A little whisky was given, but she continued to get worse, and when Mr. Williamson

saw her she was lying on her back, quite unconscious, with her eyes closed. When the eyelids were separated, the eyes were seen to be divergent; the corneæ were insensitive; the pupils were under the influence of atropine. Her breath had the odour of whisky. The pulse could not be felt at first, but a few minutes later it was just perceptible: it was then 120, regular, and extremely small. The respirations were 40 in the minute, and regular. They were deep and sighing; the chest rose with each inspiration, the mouth opening, and the head moving back. The redness of the cheeks, nose, and chin was less than during the past few days. The whole face had a dusky hue. The movement in the right leg had ceased. The surface of the body was moderately warm. She remained much in the same state until death, which took place at 7.30 p.m.

Autopsy: Body not much wasted. There was found a quite recent hæmorrhage, about the size of a wood nut, in the right *thalamus opticus*. No other noticeable changes in the central nervous system. The *lungs* were congested; they weighed 2 lbs. 3 ozs., and were free from pneumonic and phthisical changes. The *heart* weighed $7\frac{3}{4}$ ozs.; the left ventricle was moderately contracted; the valves and orifices were healthy. The *kidneys* were larger than natural, and weighed $13\frac{1}{2}$ ozs. The enlargement seemed to be due in great measure to increased thickness of the cortex, suggestive of some tubular disease. The *liver* weighed 3 lbs. 5 ozs.; the *spleen*, 4 ozs.; neither presented microscopic signs of disease.

Microscopical Examination.—In the *convolutions of the brain*, the principal changes are dilatations of the perivascular spaces. The spaces have irregular borders; in no case are they very large, not larger than three or four times the diameter of the contained vessel. Within the spaces, at parts, yellowish-brown granules are often encountered, generally in contact with the walls of the vessels. This pigment, from its colour, arrangement, and position, would appear to be altered colouring matter of the blood. Nowhere are seen unaltered coloured blood corpuscles outside the vessels, nor are blood crystals met with. Some of the larger veins are distended with coloured and colourless blood corpuscles, and surrounding many of the vessels are numerous small round cells, with one or two nuclei, which stain deeply with hæmatoxylin—colourless blood corpuscles—which have wandered from the

vessels. The arteries are for the most part healthy; the muscular coat is not thickened, nor are the nuclei proliferating. Only in a few places are noticed the hyaline changes of the intima, to be described more fully in connection with the vessels of kidney and spleen. The capillaries present no alterations. The periganglionic spaces are almost uniformly dilated.

Medulla Oblongata: Here the changes are very like those described in the convolutions, only the hyaline change in the arteries is more pronounced. The hyaline degeneration is mainly confined to the elastic portion of the intima. The endothelium presents no changes, but is sometimes separated from internal elastic coat. The hyaline change does not as a rule invade the middle coat of the vessels. The periganglionic spaces are much dilated; the ganglion cells being sometimes shrunk, sometimes retaining their normal size. The ganglion cells, especially when shrunk, are in parts deeply pigmented, of an almost mahogany-brown colour, and their outline is indistinct.

Pons Varolii: Same changes as in medulla; the perivascular infiltration with lymphoid cells is greater, however. Veins are met with filled with colourless corpuscles; but from there being no bulging of the walls or signs of stasis, this would not appear to be due to thrombosis. Some of the capillaries are markedly dilated, but for the most part uniformly so; only in a few places can any unequal dilatation of these vessels be seen, such as would deserve the title of capillary aneurism.

Kidney: Several important changes are met with here, but I will describe these with as great brevity as possible. First, as regards the uriniferous tubes. A noticeable feature is a dilated condition of the tubes almost throughout the whole of their varying course. This is well seen, for the membrana propria stands out conspicuously, the cells often being detached from it. In some parts the membrana propria is thickened by hyaline change. For the most part the secreting epithelium is well preserved, but in parts it is granular and indistinct. In the large collecting tubes of papillary portion, the epithelium presents very peculiar changes. In some of these tubes it has a beautiful, perfectly translucent appearance. The cells are swollen, and their outline is as distinctly marked out as in a nitrate of silver preparation. The cells are so translucent that there appears nothing to hold the nuclei in position. The nuclei, in some of these

altered epithelial cells, are of natural size, and well stained by hæmatoxylin; in other cells they are swollen to three or four times their natural size, and are pale and vesicular. They present all transitions between these two states, and the advanced stage reminds one of the swollen vesicular condition of coloured blood corpuscles when treated with water. The epithelial cells suggest the idea of having had all but the skeletons of the cells washed away, and there can, I think, be little doubt that the appearances I have described in the epithelium of the collecting tubes are due to the constant irrigation to which they were exposed. In other collecting tubes the epithelium is detached, and the lumen contains granular matter. Probably this is a later condition of the former change. Some of the tubules contain hyaline or fibrinous casts. There is a small amount of lymphoid infiltration at the bases of the pyramids. In the arteries a very conspicuous change is met with. It is most pronounced in the smaller arteries—the glomerular (afferent) arteries. These vessels are enlarged in an irregular way, and their walls greatly thickened. The increased thickness of the walls is mainly limited to the intima of the vessels, and consists of a hyaline transformation of this coat. The endothelium is, for the most part, intact, not swollen or altered in appearance. Sometimes it is crumpled up into a fold in the lumen of the vessel, and sometimes, whilst the individual cells preserve their mutual cohesion, it is detached from the rest of the intima. Between the endothelium and the muscle layer is a hyaline, yellowish-brown material, closely resembling in appearance the hyaline or fibrinous casts in the tubes, whilst their change involves the whole of this portion of the intima. Whilst this change involves the whole of this portion of the intima, it is rarely evenly distributed, but forms excentric bulgings at different points. The bulging is almost always towards the lumen of the vessel, which is in consequence greatly narrowed, or even obliterated. On transverse section of these vessels the lumen is often represented by an irregular space with crenated margin, the nuclei being brought very close to each other. When excessive, however, it bulges also outwards, so as, in a longitudinal section, to form a fusiform or biconvex enlargement of the wall of the vessel. Though usually confined to the intima, in some cases it involves the muscular coat, the purple stained nuclei of which may be recognised in its midst. The change usually commences just

where the afferent arteries are given off from the trunk of the interlobular arteries, the walls of the latter up to the very point where the altered afferent arteries leave them being generally unaffected. Sometimes, however, the interlobular arteries are markedly affected by the hyaline change, and here the bulging has as great a tendency outwards as towards the lumen of the vessel, appearing on longitudinal section as a plano-convex swelling. Here, too, the swelling is partial, different portions of the same vessels being affected in unvarying degrees. The hyaline change accompanies the glomerular (afferent) arteries throughout the whole of their course, generally ceasing at the point within the Malpighian corpuscles, where the vessel breaks up into capillaries. In the majority of cases the glomeruli are scarcely, if at all, affected; sometimes slight changes, similar to those in the arteries, are seen in the capillary network, rendering this indistinct. In some few instances the glomeruli have undergone atrophy, being reduced to a more or less fibrous body, in which are scattered a few nuclei. The latter change is similar to what is seen in a late state of interstitial nephritis. Sometimes, however, there is a slight increase of the glomerular nuclei. The muscularis is not thickened, unless it shares in the hyaline transformation. There is no increase in the thickness of the adventitia. The veins present no noteworthy changes. The capillaries are usually widely dilated, though for the most part empty. There are numerous deposits of amorphous matter staining purple with hæmatoxylin scattered about the kidneys, probably lime salts.

Spleen: The most conspicuous change in this organ is the hyaline degeneration of the arteries. This is extremely general, and very pronounced. It is confined to the arteries, especially the smaller ones. Many of these are completely obliterated along a considerable portion of their track by the walls being brought into apposition. Though the walls meet, they nowhere cohere. As in the kidney, the change is generally confined to the intima, though, in some instances, it also involves the muscularis. The endothelium is unaffected by the change, though sometimes stripped from the swollen elastic membrane. The swelling is irregular and excentric, in transverse section often appearing nodular. The hyaline material is almost of the same colour as that met with in the kidney; if anything, more yellow and refractive. Here, however, it has a tendency to separate by

cleavage into fibrillæ or lamellæ. I cannot decide whether this cleavage is determined by the position of nuclei. The adenoid sheaths of the arteries and the Malpighian corpuscles are somewhat enlarged, and present slight hyaline degeneration at the part immediately surrounding the altered arteries. *Liver*: There is atrophy of the liver cells which are found in various stages of fatty, granular, and pigmentary degeneration. The vascular and lymphatic capillaries are generally dilated. Some of the smaller branches of the hepatic artery show slight hyaline transformation of their intima. *Pancreas*: Epithelium more granular and indistinct than natural. Some deposits of amorphous and crystalline matter, taking a purple stain with hæmatoxylin—lime salts probably. Hyaline changes in the intima of some small arteries. *Heart*: Muscles fairly good; no important changes.

The posterior halves of the *eyes* were carefully removed. Large hæmorrhages in the vitreous were seen with the naked eye and the retina appeared thickened. After examination the globes were placed in preserving fluid and handed to Mr. Nettleship, who reports as follows:—

Microscopical Examination of the Eyes by Mr. Nettleship.

The principal changes discovered may be conveniently grouped into those in (a) the retinal and choroidal membranes and the vitreous; (b) the subvaginal lymph-space of the optic nerve and in the nerve itself; (c) and lastly, in the arteries and capillaries of the nerve, retina, and other parts.

(a) The *retina* was thickened in all its layers, the change being greatest in the nerve-fibre layer where there were numerous varicose swellings; the disc slightly swollen and its nerve-fibres converted into an intricate meshwork of fine threads, the meshes being for the most part empty, but sometimes filled by swellings like those in the retina. The thickening of the other retinal layers appears to be the result of chronic œdema with hypertrophy of the connective framework. The ganglion cells and the granule layers are well preserved, and indeed more readily seen than usual, their elements having been, as it were, dissected apart by the effusion of fluid between them; the fibres proceeding from the ganglion cells beautifully seen. Bacillar layer wanting and its place in some parts occupied by a layer of albuminous effusion. In the intergranule and molecular layers are here and there

round spaces (microscopic cysts) filled with large faintly-refract-ing globules (albuminous). *Limitans interna* much thickened in parts, and thrown into abrupt folds, which, when deep, resemble papillæ. The retina was much more thickened in the left than in the right; in the former it measured from two to three times its normal thickness. There were no distinct hæmorrhages in the retina, only one or two small patches of rusty-looking granules being seen near the disc.

The *vitreous* in the left eye contained a large quantity of blood, apparently of different dates, and forming a dense layer lying upon the *limitans interna* of the retina. The more superficial (vitreous) part often shows distinct lamination, the lines of which are sometimes arranged so as to suggest that the bleeding took place from different spots in a gradual manner, one mass of blood thus being intruded into another. The deepest (retinal) part of the clot contains many large dark rust-coloured nucleated corpuscles (resembling the cells of the vitreous) and granules (degenerated blood). Some of these coloured corpuscles and granules lie between the layers into which the thickened *limitans interna* is often split up. The source of the blood could not be traced.

The *choroid* at the margin of the optic disc is unaltered, but immediately on leaving that line it begins to thicken. The thickening increases rather rapidly, until at a distance of about one and a half or two discs' breadths from the border it is five or six times greater than normal; after this point it remains about the same. The change is greatest in the deep vascular layer, least in the chorio-capillaris, and intermediate in degree in the supra-choroidal space. It is caused (1) by great distension of the large vessels, both arteries and veins; and (2) by the collection of faintly-granular albuminous substance in the stroma between the vessels and in the elongated spaces of the *membrane supra-choroidea*. There is slight and doubtful increase of the colourless lymphoid corpuscles of the choroid.

(b) The trabecular tissue of the *subvaginal lymph-space* of the optic nerve is much increased in bulk, partly by thickening of the individual cords, partly by increase in their number. Excepting at the extreme ocular end of this space, there did not appear to be any increase of the cells clothing the trabeculæ, and even there this change was not great. The inner sheath of the nerve was somewhat thickened.

The *optic nerve* showed no very marked alterations. Its connective-tissue nuclei were increased in number in and just behind (= on the brain-side of) the *lamina cribrosa*; and further back (as far as three-fourths of an inch from the eye) they were unusually conspicuous, apparently from being somewhat swollen. The nerve-fibres were unusually varicose, and as the eyes were removed shortly after death in cold weather, it is probable that this was not altogether a *post-mortem* change.

(c) The most interesting changes are those in the blood-vessels, and although these are essentially similar to the changes in the vessels of the other organs examined by Dr. Mackenzie, a description of them will be of interest from the ophthalmological point of view. I must add that I did not fully observe and appreciate the vascular disease in the eyes until Dr. Mackenzie had shown and explained to me his preparations from the spleen, kidney, and other parts.

It is to be noted first, that there was great distension of all the vessels in the choroid and retina, as well as of the branches of the ciliary arteries surrounding the optic nerve in the sclerotic and of the nutrient arteries of the optic nerve-sheath.

The special changes in the arterial coats were, however, much more marked in the *arteria centralis* and its branches than in the scleral vessels, and were scarcely present at all in those of the choroid. The best marked alteration consists in a thickening of the layer immediately external to the endothelium, and this may occur either uniformly for a long distance or in circumscribed portions. Thus in the trunk of the *arteria centralis* there is a long tract of thickening between the endothelium and the fenestrated membrane, affecting, however, only one side of the vessel (as seen in longitudinal section) and rather suddenly increasing at one part so as to form a considerable swelling by which the lumen is notably contracted (Fig. 1); (a second and quite similar swelling is present lower down in the same vessel). In the retinal branches of this artery the thickening is much more general, although varying greatly in degree in different branches. As a rule the relative thickening of the coats is much greater in the very minute arteries than in those of larger size (Figs. 2, 3, and 4). In an early period the new material is more or less distinctly corpuscular (Figs. 1 and 2), and its innermost portion sometimes appears composed of superimposed layers of endothelia

(Fig. 1). In many specimens, where the disease is apparently of older date, the appearance is best described as partly hyaline and partly fibrous (Figs. 3 and 4), the hyaline change being most

Fig. 1.



Fig. 2.



Fig. 3.

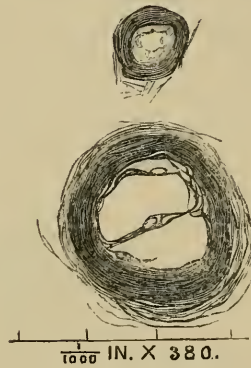


Fig. 4.

Fig. 1. Art. Centr. Retinæ. Longitudinal section. Upper end of drawing is at level of deepest part of *lam. crib.* Thickening of one side of vessel, and narrowing of lumen from nucleated growth between endothelium and elastic lamina; detachment of endothelium; (?) increase of muscle cells opposite thickest part of swelling.

Fig. 2. A rather small artery from nerve fibre layer of retina. Müller's fibres and ganglion-cells bound one margin (the upper in the figure). Thickening of the entire arterial wall, with separation and some obscuration of nuclei (this point not well shown in the woodcut).

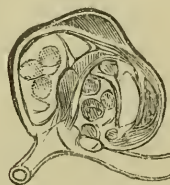
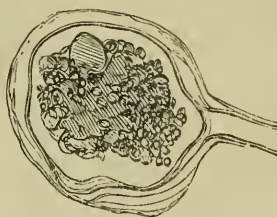
Figs. 3 and 4. A minute and a medium-sized retinal artery seen in transverse section. Hyaline thickening of coats with indistinctness of the muscle nuclei; in the large vessel a more fibrous appearance. Alteration of the endothelium.

obvious in the smallest vessels. The endothelium is often separated in single cells or in irregular sheets (Figs. 1 and 4), and in the smallest vessels sometimes looks as if swollen (Fig. 3). The

relation of the muscular coat to the morbid change is not easy to make out in all cases. In such a vessel as is depicted in Fig. 2 it appears that the whole vascular wall external to the endothelium is swollen, but on examination with high power no evidence of increase in the muscle-cells is apparent; rather the whole tissue appears swollen and dim, the nuclei being less apparent than in health (the nuclei as represented in the woodcut are too conspicuous). In others (as seen in Fig. 1) there is some increase of corpuscular elements in the situation of the muscular layer just at the part where the greatest internal thickening is present. In the more hyaline vessels (Figs. 3 and 4) it is difficult to make out any trace of the muscle layer, only a few obscure nuclei being visible. A uniform thickening of the fenestrated membrane is the only change visible in a tolerable number of arteries.

The veins as a rule are merely distended, their coats not altered. Some of the large branches on the disc, however, pre-

Fig. 5.



1000 IN. X 380.

Fig. 6.

Figs. 5 and 6. Two retinal capillary aneurisms. One contains a mass of brownish-red granules of various sizes. The other is (or appears to be) chambered by septa or bands, probably altered endothelia; some globules of albuminous matter and altered blood corpuscles seen in its cavities.

sent numerous cells like leucocytes, in and immediately outside their coats; this, which is a perfectly definite change when it occurs, is noticed in only a few of the veins. It may here be noted that some of the blood-vessels in the tissue outside the sclerotic were surrounded by circular thin-walled spaces, probably distended lymphatic sheaths.

The capillaries of all parts are distended. In the retina there are minute aneurisms on the capillaries. These are not very abundant; they often occur in little groups of about half a dozen or less near together, large adjoining tracts being quite free from them. They are globular pouches, apparently communicating with only one side of the vessel; never fusiform dilatations (Figs. 5 and 6). They usually contain some reddish-brown granules, and sometimes similar granules are seen lying in the tissue just external to them, suggesting that the bleeding into the vitreous may have been due to the consecutive rupture of a number of these minute sacs. One of them appears to be divided into chambers (Fig. 6). The capillary walls are as a rule not much, if at all, thickened, but here and there considerable thickening is seen.

It will be seen that the eye-disease first manifested itself in a characteristic manner by disturbance of vision; and that polydipsia and polyuria had preceded the ocular symptoms for about a year. The diabetes was severe, as evidenced by the amount of urine and sugar daily excreted. The patient generally passed about a pound of sugar per diem, and sometimes considerably more. Further, the patient died, whilst her blood was loaded with sugar, with that peculiar form of coma which has been termed "diabetic coma," or "coma-collapse," and which has been attributed by Kussmaul* and Rupstein† to the development of acetone in the blood—*acetonæmia*.

It may be thought that death was determined by cerebral hæmorrhage, for there was an extravasation into the

* Zur Lehre vom Diabetes Mellitus, Deutsch. Arch. f. klin. Med., 1874, xiv, 1-47.

† Centralblatt f. die Med. Wissensch., 1874, No. 55, s. 865.

right thalamus; but I do not think this had necessarily or exclusively to do with the coma. I have watched several other patients die in quite a similar manner, and on *post-mortem* examination, no gross change, such as hæmorrhage, has been found. This is also the general experience. The hæmorrhage found was recent, and was on the same side as the convulsive movements noticed in the right foot. It could not, therefore, have given rise to the latter, though the cause of these movements was not discovered. The cord has not been carefully examined microscopically. It will be observed that the patient's urine contained albumen, and it becomes of importance to try and determine what share, if any, the kidney had in producing the retinal changes and extravasations into the vitreous. It will be noticed that the urine contained only "a trace" of albumen throughout the observed progress of the case. It was daily examined. There was, also, slight oedema of the feet. The kidneys were larger than natural on *post-mortem* examination, and the increase was mainly of the cortex. The microscope shows slight changes in the tubes, and a very slight degree of intertubular infiltration. These changes undoubtedly indicate a very slight amount of parenchymatous and interstitial nephritis, and are quite in harmony with the persistent presence of a small quantity of albumen in the urine, and the oedema of the feet. But the renal affection was really very slight, and the kidneys were able to perform their functions, as evidenced by the amount of urea daily excreted by them. A further proof that the kidney disease was not severe or of long standing, or that the general vascular degeneration—"arterio-capillary fibrosis"—was non-existent, is that no hypertrophy of the heart was present. The amount of renal disease appears no more than their over-taxed functions would be likely to induce. The increased bulk of the kidneys (the two weighing $13\frac{1}{2}$ ounces), was mainly due to the dilated condition of the uriniferous tubes and blood-vessels. There was a peculiar change in

the arteries of the kidney, but this is distinct from the changes usually met with in Bright's disease. There, therefore, appears no clear evidence that there was such an amount of renal disease as to call forth secondary changes, like retinitis. For the same reason, there is nothing to warrant the opinion that the coma was due to uræmia. I think, therefore, we are justified in excluding the kidneys as the cause of the changes in the retina and vitreous. There was no disease of the heart to account for the hæmorrhages. As regards the minute changes in the intra-cranial organs, they are slight and similar to what have been noticed before,* with the exception of the hyaline change in the intima of the arteries. Similar vascular changes are also found by Mr. Nettleship in the retina, but are not peculiar to, or most marked in, nervous structures. With reference to this hyaline change of the intima of arteries, from my description it will be seen that, though widely distributed, it is most marked in the kidney and spleen, and its nature can be best studied in those organs. It seems to be a peculiar transformation of the elastic portion of the intima, though it sometimes, as Mr. Nettleship has noticed in the retina and optic nerve, and I have observed in the kidney and spleen, extends beyond these limits and invades the muscular coat. The material in question has a peculiar faint yellow to yellowish-brown colour in logwood preparations, is somewhat highly refracting, and appears homogeneous, with a tendency to become fibrillar. It is not acted on by iodine or methylaniline in a similar manner to amyloid or lardaceous material. This change is a very interesting and important one. It is identical with what Dr. E. Klein has described in the arteries of the kidney and spleen in scarlatina,† and in the spleen in enteric fever.‡ Fr. Neelson§

* Dickinson, loc. cit.

† Reports of the Medical Officer of the Privy Council. New Series, No. VIII.

‡ *Ibid.*, No. VI.

§ Archiv der Heilkunde, 1876. Heft ii und iii, s. 119.

has noticed a somewhat similar change in the capillaries of the pia mater in some of the acute infectious diseases and in various other diseases (syphilis, phthisis, pneumonia, dysentery, rheumatism, &c.), and other observers have noticed colloid or glassy degeneration of arteries and capillaries of the pia mater in connection with brain diseases. The change in my case exactly corresponds with what Dr. Klein has so well described and delineated, in connection with scarlatina and enteric fever, with what I have found (in the spleen) in all the cases of pyæmia I have examined, and with the appearances seen in a case of sub-maxillary cellulitis (angina Ludovici) I have investigated. I can quite corroborate Dr. Klein's statement that the change is external to, and independent of, the endothelial lining of the arteries, and that it is situated in the elastic membrane of the intima. The change, Neelson observed, is similar to the "hyaline fibroid" change of the adventitia, first described by Sir Wm. Gull and Dr. Sutton,* from which this change in the intima is distinct. I have found this change in a slighter degree in other cases of diabetes, but am not aware of its having attracted other observers' attention.

Though this hyaline transformation of the intima well deserves, from its effects, the title of "obliterative arteritis," it is quite different from the "obliterative arteritis" described by Friedländer,† or the change identical to the latter, described by Heubner,‡ under the name of "syphilitic degeneration of the cerebral arteries." The change in the intima of the renal arteries, in my case, is greater than in any case of scarlet fever I have seen, or in cases of pyæmia. It is interesting to note that in most of the diseases it is met with, there is some profound alteration in the blood; and this altered condition of the blood, and of relation between blood and blood-vessels, may

* *Medico. Chirurg. Trans.* 1872, p. 273.

† *Centralblatt f. d. med. Wissensch.* 1876, No. 4, s. 65.

‡ "Ueberluetische Erkrankung der Gehirnarterien," Leipzig, 1875.

have something to do, also, with the hæmorrhages. It is noteworthy that Dr. Klein has met with the hyaline change of the arteries and capillaries most marked in early cases of fatal scarlatina, before there is any interstitial nephritis, and he finds no reason to believe there is any relation between the two. In most of his cases there was no albumen in the urine. He also finds in scarlet fever proliferation of the muscle nuclei in vessels presenting this change, though not limited to these. In my case, there is no increase in the muscle nuclei.

The occurrence of similar hyaline changes in the arteries of the retina (as illustrated in the woodcuts) is a point of much interest; although it must be remembered, that the changes are not so pronounced in the retina and optic nerve as in the kidney and spleen, more resembling those in the liver and pancreas. But a point of still greater importance is the existence of aneurisms of the retinal capillaries. Their existence may serve to explain, as Mr. Nettleship suggests, the hæmorrhages into the vitreous. Professor Leber is also inclined on other grounds to attribute the vitreous hæmorrhages to repeated bleedings from small retinal vessels.

CASES OF FOREIGN BODY IN THE EYE.

By FREDERICK MASON,

Surgeon to the Bath Eye Infirmary.

CASE I.—*Foreign Body in Eye for seventeen years, ten years without producing active disturbance.*

H. W., æt. 32. Was admitted an in-patient of the Bath Eye Infirmary on the 26th February, 1870, for what was supposed to be a case of severe catarrho-rheumatic ophthalmia of the right eye, there being at that time no appearance or history of accident. There was chemosis, iris inflamed and pupil fixed. This inflammation had commenced seven weeks previously. He had been under treatment, had taken mercury, and the gums were spongy and bleeding.

On the 26th March the inflammation had subsided, the pupil elongated upwards and outwards, and not dilatable, the eye was quiet, and he was discharged from the infirmary.

On the 3rd March, 1877, he was readmitted.

Right not inflamed. Cornea less in diameter than left, with an indistinct scratch-like scar running across the lower half. Anterior chamber small. Iris tremulous, with appearances of former inflammation. Pupil central, round, and fixed. Sclerotic blue, in patches. T.n. No perception of light.

Left. Can read J. 2, but it becomes watery on looking at near objects. Os. od. normal. Choroid dark, and no reflection of red light from it.

The scar on right cornea giving rise to a suspicion that the eye had been injured by accident, he was closely questioned, when he recalled to remembrance the following circumstance which, not thinking of any importance, he had until now forgotten:—

In September, 1860, he was working for an ironmonger, and was engaged knocking iron hoops from a cask with an iron chisel when a piece flew off and struck the right eye. He says the piece came out of the eye on the following day. He suffered but slight inconvenience, and did not apply for advice for five or six weeks, when vision becoming dull he consulted the late Mr. Vicary of Warminster. The eye was then inflamed for two days.

Vision continued good, but not equal to that of the other eye, for 10 years, that is until the attack of inflammation in 1870. After leaving the infirmary in that year, he retained vision for 12 months, then quietly losing it without pain or any further inflammation. During the last two years the eye has been occasionally very painful and sometimes acutely inflamed; the inflammation lasting for a few hours only, and for about the same time the left has been watery and weak.

On March 4th, 1877, the right eye was enucleated. On making a transverse section through the sclerotic, dividing the globe into an anterior and posterior half, the vitreous was found to be of a very pale straw colour, very fluid, and of not greater density than the aqueous. Behind the retina and surrounding the od. lymph had been effused apparently in the course of the vessels. There was no trace of lens, but some shreds of capsule behind the iris. The pupil was filled with a semi-transparent lymph.

Firmly imbedded or encysted within the fibres of the iris a foreign body could be felt, not seen; this was with difficulty removed, and proved to be a minute fragment of iron, ☉ which must have entered the eye at the time of the accident 17 years before, remaining in it for 10 years without causing any active disturbance.

On the 10th March, the wound being nearly healed and vision of the left much improved, he was sent home.

Mr. Willcox, of Warminster, has furnished me with the following additional particulars:—

June 5th 1877. "I have carefully examined H. W.'s eye this evening. There is no sign of any inflammatory condition. The cornea and all the media are clear; there is no congestion of the vessels of either the conjunctiva or sclerotic. He says the eye is somewhat weak, and there is slight lachrymation when exposed to the sun or the wind. He can readily decipher the addresses of letters (he is a letter carrier), and he can recognise people easily across the road. The pupil dilates readily and regularly with an atropine disc, and the ophthalmoscopic appearance of the fundus is normal. He volunteered the statement that he is entirely relieved of the brow pain, which before the operation had been very great."

CASE II.—*Foreign Body in one Eye for Four Years before Sympathetic Irritation of the other.*

J. W., æt. 62, was admitted an in-patient of the Bath Eye Infirmary, May 29th, 1877.

On the 5th November, 1873, when breaking stones, he was struck on the right eye and received a wound of the cornea; he became a patient at the United Hospital, and remained under treatment there for seven weeks. He has at various times sought advice at other institutions.

Within the last week vision has failed in the left; and everything now appearing cloudy and dull he came to the Eye Infirmary.

Right. Cornea opaque at the lower and outer border showing the scar of an old wound which penetrated through the iris and ciliary region; pupil obliterated. T —1. Vision nil, and he has frequent attacks of pain in the right. Left. Os. media hazy, od. not clearly seen, choroid dusky with numerous faint cloudy black patches. T + 2. Vision: perception of large objects, but everything hazy.

May 30th. Right enucleated. On making a section a piece of carboniferous limestone, flat and quadrangular in form, about $\frac{1}{8}$ " long, $\frac{1}{8}$ " wide, and $\frac{1}{16}$ " thick on one edge, but sharp on the other, chisel shaped, was found lying upon the posterior surface of the ciliary processes, between them and the remains of the lens capsule, and surrounded with organised lymph which was firmly adherent to the stone. The lens was absorbed and the retina detached and forming a fold of membrane stretching backwards from the capsule. Deposits of lymph on choroid.

June 2nd. Vision of left already much improved, cloudiness gone, he can see the hands and tell the time by the watch.

9th. Considers himself quite well, and vision as good as ever.

Os. media clear. The cloudy dark patches on choroid have disappeared. The intervacular spaces are of a dark colour, but well defined. Od. normal. He has never learnt to read, but can distinguish the spaces between the letters in J. 3.

CILIO-RETINAL BLOOD-VESSELS (ADDITIONAL CASES AND REMARKS).

BY EDWARD NETTLESHIP, F.R.C.S.,

Surgeon to the South London Ophthalmic Hospital.

SINCE recording elsewhere* some cases in which a communication between the retinal and ciliary vascular systems could be seen by the ophthalmoscope, I have been on the watch for other examples. The result has shown, as was suspected, that this condition is much more common than has been supposed,† so common indeed that when the attention has once been drawn to the subject, scarcely a week passes without one or more examples coming under notice in the ordinary routine of ophthalmoscopic work. I have not attempted to make notes of all the cases in which I have seen this deviation, but have appended to these remarks seven additional cases, some of them with diagrams, and have also reproduced the diagrams and descriptions of cases originally published in the British Medical Journal. This series of figures, although rudely executed and much simplified for economy by the omission of unessential details, may, I think, be taken as representing with sufficient accuracy some of the commonest, as well as the more exaggerated, types of this anatomical variation.

In the earlier observations I was obliged to infer that the errant retinal vessel ran into the choroid or sclerotic, never having been fortunate enough to prove in a microscopical specimen the presence of a vessel taking this course, and yet large enough to have been visible by means of the ophthalmoscope.

* British Medical Journal, Feb. 5, 1876, and Ophth. Hosp. Reports, vol. viii, p. 512.

† See Leber in Graefe & Saemisch's Handbuch d. Augenheilkunde, ii, 1, 307; and Loring, in Knapp's Archives II, ii, p. 9.

In examining lately the sections of a swollen (*neuritic*) disc from a case of cerebral tumour (Amelia Childs, No. 42), which had been under care at Moorfields, I found in one of them an artery of considerable size passing from the sclerotic at the level of the upper surface of the *lamina cribrosa* into the optic disc, where it could be followed nearly as far as the free (vitreous) surface (Fig. 1). The course taken by this vessel is such that it could not but be distributed to the retina. The section was made in the horizontal plane, and the vessel alluded to is on the side next the *y.s.*, as proved by the characters of the retina, &c.; the position of this vessel, therefore, agrees precisely with that of the similar vessels observed during life.

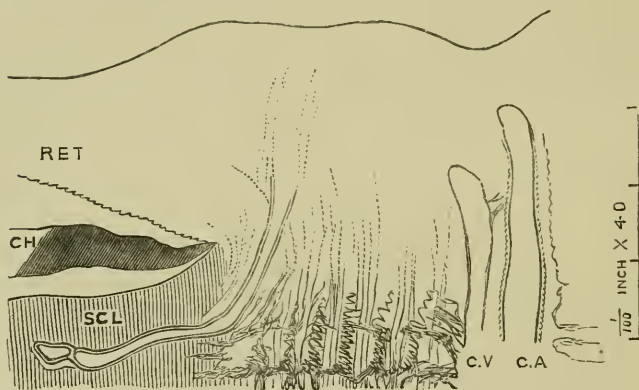


Fig. 1. Section showing a large artery passing from sclerotic into optic disc and retina on the *yellow spot* side. Its diameter is from $\frac{1}{3}$ to $\frac{1}{2}$ that of the *arteria centralis* (C.A.). C.V., *vena centralis*. $\times 40$.

It may be suggested that in this case (Case V*) the communicating artery may have become somewhat enlarged to compensate for the diminished supply of blood delivered through the constricted scleral ring by the *arteria centralis*. Two considerations, however, render it unlikely that such an enlargement would be very considerable in a case of neuritis, such as this: (1) The sclero-retinal vessel is itself

* The numbering continued from the former series, vol. viii, p. 513.

subject to pressure at the scleral ring, only slightly less in degree than that exerted on the *arteria centralis*; (2) It is well known that the arteries in the retina do not anastomose, unless here and there by means of a few capillaries (see vol. viii, p. 262 of these Reports); and in all probability, therefore, no enlargement of a single arterial branch could add materially to the blood supply of any but its own proper segment of the retina.

The following general statements may be made on the subject of this deviation:—

1. It is common to meet with healthy eyes in which a retinal vessel on reaching the disc turns sharply back and disappears under the rim of the choroid, as if running into (or emerging from) either the choroid or sclerotic.

2. This cilio-retinal vessel may be either an artery or a vein. It is generally very small (see Fig. 8), but may be as large as one of the main divisions of the *arteria* or *vena centralis*. (Figs. 2, 3, 4.)

3. Such vessels are always situated on the temporal side of the disc, and pass to (or from) the yellow-spot region of the retina.

4. Such a vessel is generally present in only one eye, but is occasionally met with in both. It is usually single, but two vessels may take this course in the same eye.

5. A cilio-retinal vessel can in most cases be readily distinguished from the other branches (generally of small size), which are often seen to enter (or emerge from) the optic nerve at various points between the temporal border and the physiological pit. There is some difficulty in drawing this distinction when the vessel disappears very near to the border of the disc, and it may be impossible to say in such a case whether the vessel passes straight down the nerve or curves back to join the sclerotic.

6. Anatomists are not agreed* as to whether those vessels which disappear between the border and the physiological pit are branches of the central retinal vessels

* Leber, loc. cit.

given off before reaching the eyeball, or branches of the ciliary vessels from the sclerotic, and the fact that the latter connection can often be demonstrated during life for one vessel makes it highly probable that many of the other small branches alluded to are also offshoots of the ciliary system.

7. The cilio-retinal vessels do not appear to anastomose with the other retinal vessels either on the retina or optic disc.

8. Whenever the case admits of complete demonstration (Figs. 1, 4, and 6), the vessel joins (or emerges from) the sclerotic, not the choroid. It is at present uncertain whether it is ever a branch of a choroidal vessel.

9. The presence and size of this communicating vessel does not appear to bear any relation to disease. It is, when present, more easily recognised and traceable further, if there be an atrophic crescent, than when the choroid at the border of the disc is healthy. It often seems to taper off a little towards its point of submergence in the choroid or sclerotic; this appearance being explained in the same manner as the similar apparent tapering of the *arteria* and *vena centralis* in the physiological pit, and not indicating any diminution in size.

10. No practical significance can at present be attached to this peculiarity in the blood-supply of the yellow-spot region of the retina. Should further observation show that several of the smaller vessels passing directly from the disc to this region are generally branches of the ciliary vascular system, and not derived from the central retinal vessels, the fact may throw light on some of the functional and structural diseases of this important part.

ADDITIONAL CASES.

CASE VI.—Thomas S. (Mr. Hutchinson's patient for syphilitic retinitis; T. 123). In the left eye a large artery, distributed to the parts below the yellow-spot, emerges from under the choroidal rim of the disc, and after making a very short and abrupt curve,

passes on to the retina. (Fig. 2.) The border of the optic disc is even and unpigmented everywhere, excepting just where this artery emerges, but here it is notched slightly outwards, and the pigment appears to be somewhat heaped up, forming an abruptly black edge. (Fig. 2.)



Fig. 2 (see Case VI).

CASE VII.—Walter S., æt. 18. Under care for disease of the vitreous without apparent cause, in the left eye. Refraction hypermetropic, but with some astigmatism; a narrow crescent of choroidal atrophy bounds the disc at its (real) lower and outer part. A retinal vein of considerable size, passing from below the yellow-spot region inwards and upwards, on reaching the surface of the disc curves back, leaves the disc, again crosses the surface of the atrophic crescent, and disappears under the border of the choroid. (Fig. 3.) This note was made after the vitreous had to a great extent cleared, vision with this eye being 1 J. fairly, and $\frac{20}{40}$ Sn.



Fig. 3 (see Case VII).

CASE VIII.—James E., æt. 21. Myopia 9 *d.* in right, and 13 *d.* in left. In both a large abruptly limited posterior staphyloma, and in the left some separate patches of atrophy near the yellow spot; no changes at the periphery of the fundus.

In the left the staphyloma entirely surrounds the disc, being wider on the yellow-spot side. A retinal vein of the second magnitude passes from the (apparent) upper-inner part of the fundus (apparently above the yellow-spot region), makes an acute S bend and dips into the exposed sclerotic forming the background of the staphyloma at a distance from the border of the disc equal to about one quarter the diameter of the latter. (Fig. 4.) A large

choroidal vessel is seen, somewhat dimly, in near relation to this retinal vein on the staphyloma, but there is no proof of a junction between the two. The appearances, and particularly the abrupt bend made by the vessel, could be accounted for by supposing that before the staphyloma was formed the retinal vein passed on to the disc, formed a loop, and disappeared in the usual manner beneath the choroidal rim; but that in consequence of the stretching and displacement of parts in the formation of the staphyloma, the single loop was converted into an S quite removed from the disc, while the point of entrance of the vessel into the sclerotic became exposed.

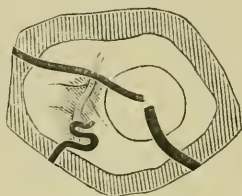


Fig. 4 (see Case VIII).

CASE IX.—Eliza T., æt. 67. A patient with atrophy of the discs of many years' standing, probably following neuritis. Right eye no p.l.; left sees 19 J. barely, with + 5 = 12 J. barely.

In the left a vessel of about the fourth magnitude appears to join the sclerotic, as in the other cases, at the yellow-spot side of the disc. There is no crescent, however, and the vessel therefore cannot be actually seen running into the sclerotic. It was apparently an artery.

CASE X.—Emily B., æt. 23. High myopia, with a staphyloma entirely surrounding the disc in each eye. In the right, which has more than $\frac{1}{3}$ of myopia, two retinal vessels join the sclerotic or choroid in the usual manner.

The following woodcuts (Fig. 8 excepted) are reproduced from the British Medical Journal, Feb. 5, 1876:—

Fig. 5.—Frederick M., æt. 12. Highly myopic, with a tolerably sharp, rather narrow staphylomatous crescent. A vein of the third magnitude passes from the (apparent) lower-inner part of the fundus (*i.e.*, really from above the *y.s.* region). On reaching the border of the disc, it turns back and disappears at the junction of the atrophic and healthy choroid. A small venous twig

coming directly from the *y.s.* region joins this vessel just as it is about to disappear.



Fig. 5.



Fig. 6.

Fig. 6.—Gertrude H., æt. 25. Myopia $\frac{1}{7}$, with a wide crescentic staphyloma on the *y.s.* side. A retinal vein of the fourth size passes inwards from the *y.s.* region, crosses the staphyloma, bends sharply upwards just before reaching the disc, and disappears partly upon and partly external to the scleral border. It appears to enlarge slightly at its point of disappearance.

Fig. 7.—Lizzie W., æt. 20. Hypermetropia. An artery of the third or fourth size passes from below the *y.s.* region on to the disc, curves back, and disappears at the choroidal rim or just external to it. (A minute twig, which was figured in the original case as appearing to connect this vessel with another on the disc, has here been left out, the evidence of anastomosis being imperfect.)



Fig. 7.



Fig. 8.

Fig. 8.—Ellen S., æt. 35 (Case II, vol. viii, p. 513).—Atrophied right optic disc, showing a small vein running from rather below the *y.s.* turning over the edge of the disc and disappearing under the choroidal rim. There had been no intraocular neuritis.

The vessel in this case presents a good average example of the variation described; in the majority of cases it is of about the size here shown.

CLINICAL NOTES AND CASES.

By EDWARD NETTLESHIP, F.R.C.S.,

Surgeon to the South London Ophthalmic Hospital.

(Continued from vol. viii, p. 520.)

The cases given below illustrate the following diseases:—

1. *Retinitis pigmentosa*—four cases with family histories, two of them extending back in considerable detail for two or three generations. These cases, while strongly confirming the frequency of heredity in this disease, show no evidence that blood relationship in parents has any special influence. (Cases 1 to 4.)

One of the patients (Case 1) presented a particularly symmetrical, regular, and uncomplicated form of posterior polar cataract, of which it seemed worth while to give a woodcut.

There was a history of serious disease of the nervous system, in one or more previous generations, in three of the cases.

2. Two cases of choroiditis or choroido-retinitis, with history of diseases of the nervous system in brothers or sisters. One of the patients is herself the subject of peculiar nervous symptoms. Hereditary syphilis was not excluded in either of these cases. (Cases 5 and 6.)

3. A case of amaurosis with atrophy of discs preceding general paralysis of the insane. (Case 7.)

4. A case in which a man presenting many of the most marked symptoms of disseminated sclerosis (as described by M. Charcot in his Lectures translated by the New Sydenham Society) has been under care on account of his ocular symptoms for nearly three years. (Case 8.)

5. Localised exudative choroiditis, with retinitis, at or about the age of puberty, and without recognised cause. These cases are very peculiar, and deserve most detailed study from the etiological and pathological points

of view. In ophthalmoscopic appearance the diseased patch in such a case bears more resemblance to a tubercle in the choroid than to any of the ordinary forms of choroiditis. It becomes a question whether in strumous or tubercular subjects, such as these patients were, localised inflammation, approaching suppuration, may occur in the deep structures of the eye without evident cause. Whether strumous or not, it is important to enquire whether such changes as may be seen in the eye in these cases may take place in other important organs, especially in connection with the nervous system. (Cases 9 and 10.)

I believe that cases resembling the two here given are by no means common, but remember to have seen one or two closely similar to them in Mr. Hutchinson's practice at Moorfields. Illustrations of identical ophthalmoscopic changes are given in Dr. Hugo Magnus's *Ophthalmoscopic Atlas*, T.V., Figs. 1—4.

6. Examples of the "choroido-retinal disease," described by Mr. Hutchinson and Mr. Tay in a former number of these Reports (Vol. viii, p. 231). The first case is of especial interest, because definite though incomplete atrophy of the discs has followed the condition of slight haziness which, in the early period of the disease, accompanied the choroidal spots. Another point of special interest in this case is that the amblyopia has been stationary, although the discs have become pale. This case and the last one in the series (No. 15) raise the question as to what is the connection between the changes in the discs and those in the choroid. It is evident that the two do not bear any constant relation to one another in degree, since in many cases where the choroidal disease is most abundant the discs are but doubtfully changed. It may be noted that the arteries supplying the part of the choroid most affected, also supply important twigs for the nutrition of the disc. (Cases 11 to 15.)

7. Some cases of choroidal disorganisation at or near the yellow-spot region in old people, in all probability

caused by hæmorrhage. The history of inflammatory symptoms in several of these cases is interesting, and is perhaps related to the rapid escape of a large quantity of blood into the choroidal tissue. (Cases 16 to 19.)

8. A case in which neuro-retinitis and choroiditis appears to have been caused by erysipelas of the face in an old woman, permanent changes being produced in the discs and yellow-spot region. (Case 20.)

9. A peculiar case of recurrent hæmorrhagic disease of choroid and retina in a young man, affecting only one eye and followed by remarkable recovery of sight. (Case 21.)

CASE I.—*Retinitis Pigmentosa*—*History of diseases of nervous system on the mother's side—No consanguinity—Posterior Polar Cataracts of unusual symmetry and regularity.*

Mary Simcox,* 36, married, is the subject of typical retinitis pigmentosa with posterior polar cataracts, and some myopic astigmatism. The pigmentation is exactly symmetrical, and extends from the equator forwards to the periphery as far as can be seen. In each eye the lowest quadrant is much less affected than the other three, and the inner quadrant the most so. The discs pale and hazy, and the retinal vessels considerably diminished. Large myopic crescent in each. A very beautiful and regular radiating form of posterior cortical cataract (see woodcut). In each eye ten striæ pass outwards from the opaque posterior pole; of these, the largest points vertically down, and the shortest up. They vary in length; the longest of them divide nearly midway between the pole and equator and, again uniting further forwards, inclose a minute oval area of clear lens (or capsule); in one or two, when magnified, a thin central line of white opacity could be seen running from end to end of the oval space so inclosed, and dividing it again into two like the mid-rib of a leaf.

She believes her sight was perfect till after her first confinement 12 years ago. She was very ill for a time, and vision began to fail slowly. Very subject to nervous occipital headaches. For

* In rare diseases of long duration, the subjects of which often go from one hospital to another, it is advisable, in order to avoid the multiplication of cases, that the names of the patients should be given in full in journals the circulation of which is strictly limited to professional readers.

the last three years has had a constant "roaring" in the right ear; never in the left. Not deaf, and has never had otorrhœa. She has seen muscæ and "coloured rings and serpents" for some time.



Posterior polar cataract, with leaf-like radiating opacities (magnified and half-diagrammatic).

Vision $\left\{ \begin{array}{l} \text{right, 12 J.} \\ \text{left, 18 J.} \end{array} \right\}$ slowly. Ps. act well.

Vision worse both at night (retinitis pigmentosa) and by very strong light (cataracts).

Family history.—All the relatives are known, and full inquiries have been made up to her father's paternal grandfather. There is no known consanguinity of marriage in any generation, but on the mother's side we can obtain a history for only one generation.

Mother's side.—She was one of about five; the precise position in the family not known for all of them;—

Sister (patient's mother) married at 30; 2 children.

1 (f.), the patient, *Mary S.*, born soon after marriage; well grown, good features, intelligent. Hair, dark brown.

2 (m.), born 13 years later (husband having been at home all the time); died æt. 3 months.

Sister, married, and had 8 children.

5 are living and well; 1 died in infancy; 1 was killed.

1 (f.), (1st cousin to the patient) is married, and has since become liable to frequent fits.

One of the sisters in this family lost a child æt. $2\frac{3}{4}$ (patient's 1st cousin), from "insanity after a fright."

Brother. Married and had 5 children.

3 are living and well.

1st. (f.), (patient's 1st cousin) became subject to fits after infancy, and died æt. 12 of "inflammation."

5th. (m.), (patient's 1st cousin) the youngest, died insane æt. 25. His sight was good.

Brother. Married; has had 10 children. No facts of interest.

Brother. Married; 3 children, all well.

On the *father's side* the only facts bearing in any degree on the case are the following:—

1. One of the patient's paternal uncles died æt. 45 of "fits following delirium tremens;" the fits attributed to a fall from a horse.

2. The eldest child of another paternal uncle (patient's 1st cousin) had infantile convulsions, "her legs never grew below the knees, and she has never walked."

CASE II.—*Retinitis Pigmentosa in a brother and sister—History of insanity and defective sight in the family on mother's side for two generations—Marriage of first cousins, but no evidence that it has caused the disease.*

William Allen, æt. 24, is the subject of typical retinitis pigmentosa, with at present only very scanty pigmentation; the changes in the disc and retinal vessels being more advanced in proportion than would be expected. His choroids are extremely pigmented, and probably this fact accounts for the defect of sight, and especially the night blindness, being somewhat greater than the stage of the disease indicates. He has never been able to see well at night, and is getting slowly worse. No deafness. Refraction normal. Black hair; brown irides; well-grown and of florid complexion; intelligence good. Married 7 months ago.

Sarah, 17, his sister, florid, well-grown, and inclined to be stout, intelligent, but excitable. Did not notice any night blindness till about 6 months ago, when she began dressmaking. Typical retinitis pigmentosa, with pale, slightly hazy discs, and much diminished retinal vessels. No opacities in vitreous, and no cataract. The pigment lies in a zone somewhat behind the equator, the parts of the retina in front of this zone, as well as those between it and the *a.d.* being perfectly free so far as can be ascertained; the zone is narrowest and the pigment least abundant, at the lowest part. No deafness. Refraction My. $\frac{1}{2}$.

The family history is long and complicated, and will be best appreciated by giving the pedigree.

First cousins.

Grandmother—Grandfather; he died insane in old age.

A half-sister of his became blind and died paralysed and insane, æt. about 30.

They had seven children, though not exactly in the following order:—

Son. Married, and has healthy children.

Son. " " " "

Daughter. " " " "

Daughter. " " " "

Daughter. Unmarried; half imbecile.

Daughter (the youngest). Married to a 1st cousin.

They have children, some of whom are said to be defective in intellect (evidence doubtful).

Daughter (now *Mrs. Allen*). Very "short-sighted," but can see well; not examined. Not related to husband by blood. Has children as follows:—

1 (f.), æt. 26. Thought to have slight defect in sight (could not be examined).

2 (m.), æt. 24. The patient, *William*. Retinitis pigmentosa.

3 (m.), æt. 22. } Nothing amiss.

4 (f.), æt. 20. }

5 (f.), æt. 17. The patient, *Sarah*. Retinitis pigmentosa.

6 (m.), died æt. 6 years. "Water on the brain;" "had no bones, and could not walk unless splintered up to the waist." Head not very large. Was intelligent. Probably paraplegic.

7 (m.), died æt. 6 months. "Inflammation on the chest."

8 (m.), æt. 12. } Nothing amiss.

9 (m.), æt. 10. }

10 (m.), æt. 8. "Very peculiar and excitable," "brain too active and head rather large." Any little excitement is apt to make him delirious and disturbed at night.

CASE III.—*Retinitis Pigmentosa, beginning in boyhood—The same defect in two brothers; the three affected brothers being the only survivors in a family of eighteen children—Mother similarly affected, and subject to fits—No consanguinity known.*

George Pearce, æt. 33, came to the hospital in May, 1873. He was a healthy looking man, with brown hair, and abundant

whiskers. He said that he could not remember ever having been able to see well at night, and that his sight had steadily got a little worse year by year; he was still able to act as assistant to a bookseller.

Ophthalmoscopic Examination.—Media clear. Conditions precisely similar in each eye. Optic disc pale, grayish yellow; its surface hazy, and semi-transparent (“waxy”). Retinal vessels very small, and only visible for a short distance beyond the disc. Abundant peripheral pigmentation of each retina; the pigment accumulations were highly characteristic, consisting of stellate, linear, and variously branched figures, mingled with which were some black dots. The pigment formed a sharply defined zone at the periphery, and was not visible unless the patient looked considerably to one or other side of the observer’s eye; it was much more abundant at the upper and outer part of the affected zone in each eye than in any other portion. There was no evidence of choroidal disease, excepting slight pallor and irregularity of its pigment close to one part of the edge of each disc, and in one eye two or three small white, ill-defined dots in the choroid near the disc, doubtfully pathological.

Family History.—The patient knew nothing of any relatives further back than his parents; he said he was certain that his father and mother were not blood-relations. His mother had bad sight from his earliest recollection, and eventually she became “quite blind;” she could at first see better by day than at night. She was subject to “epileptic fits” from the age of about 18 upwards. She had 18 children, of whom 15 died, as the patient believed, in infancy. The eldest living was the first born, and the two next (of whom the patient was one) were either the second and third born, or at any rate came quite early in the family; they all had bad sight. All are males.

1 (m.), æt. about 40, said to have been “quite blind” for about eight years, and had bad sight for long before.

2 (m.), æt. about 37; now nearly blind.

3 (m.), æt. 33, *the patient*, reads 16 J. in the daylight, but can see scarcely anything after dusk. He shows no signs of hereditary syphilis; unfortunately I have no note about the acquired disease, though from his having for twelve years had a perforation of the soft palate, it is almost certain that he has had the disease. Has been married ten years, and has several children, in

some of whom there is a history suspicious of inherited syphilis. I have noted no deafness in the patient, and should hardly have omitted it had it been present in any marked degree.

CASE IV.—*Retinitis Pigmentosa*—*Failure of Sight not beginning till æt. 35*—*Pigment rather scanty*—*A half-sister reported to be similarly affected*—*Probable inheritance from Father in both cases*—*No consanguinity known.*

Betsy Smith, æt. 52, came under care in *February*, 1874. She dated the failure of her sight from a severe illness, “nervous debility” about 15 years before; she believed it had been perfect till she was about 35. She could still see to read large print, and to write, with her + 20 spectacles. She was of small stature, old looking, and feeble; had lost many of her teeth, and had for years suffered much from indigestion, probably from bad living.

The optic discs were slightly hazy, and of a yellowish white colour; retinal vessels extremely diminished; the retina was pigmented at the periphery, but the changes in this respect were not so far advanced as the state of the retinal vessels led one to expect; the pigment deposits were widely scattered, and comparatively few in number; most of them were small, straight lines of black, a few of which presented a small circular enlargement at one end; there were scarcely any spots or patches of pigment, and very few stellate figures. There was slight nuclear haze of the lenses, and some peripheral striæ, but no posterior polar opacity. I noted that the right disc was paler and less hazy than the left. There were no signs of hereditary syphilis.

Family History.—Her father’s mother “went nearly blind” in old age, and the patient’s father himself also had bad sight when an old man, but no details of the cause of the failure in these two cases could be ascertained. The father married twice, and had two families. One of the patient’s half-sisters (her father’s daughter by the second marriage) is stated to have the same failure of sight with night-blindness, as the patient. The father is said not to have been related by blood to either of his wives.

CASE V.—*Conditions simulating Retinitis Pigmentosa, with disease of Vitreous and Myopia—Latterly Nystagmus and increasing Amblyopia—Nervous Symptoms, ? caused by Nystagmus or by Cerebral Disease—Insanity in a Brother—Hereditary Syphilis probable.*

Ellen W——, 47, admitted in *October*, 1876, with nystagmus. Hair nearly black. V. about 12 or 14 J., varying with the light. Constant lateral nystagmus, continuing even when the lids are closed. Slight central haze of each cornea. Pulse active, round, and of normal [size. Ophthalmoscopic changes symmetrical, but rather more abundant in the right. Lenses clear. A sharply circumscribed floating body, deeply seated in the vitreous of the right; none in the left. Refraction probably myopic, but the oscillation prevented positive proof. Abundant pigmentation of retina in bone-corpuscle shapes, dots, lines, and larger irregular spots. *o.d.* pale and “waxy.” Slight choroidal changes near *o.d.* (myopic), but elsewhere no proof of former choroiditis.

The pigment spots were not distributed quite regularly, nor were they so uniform in size and shape as in typical retinitis pigmentosa.

No proof of hereditary syphilis, but physiognomy rather suspicious, and she is the first born. She probably, from the history, had purulent ophthalmia in infancy. Has never been able to smell since infancy (? syphilitic disease). Other special senses perfect. The second child (m.) died of measles, *æt.* two years. The third (m.) died, *æt.* 32; insane from “softening of the brain.” There were three others by her mother’s first marriage, and four by a second marriage, but all died in infancy.

Patient’s mother died, *æt.* 49, in her third attack of “apoplexy.” Had been paralysed on left side in one of the previous attacks. Father, a publican, died, *æt.* 47; insane; it appears doubtful whether it was delirium tremens or not.

She appears not to have been much inconvenienced by her eyes until a year and a half before I saw her. She had been accustomed to do needle work in the dark waiting-room of one of the underground railway stations, and had formerly been able to do the finest work, though always near-sighted. About *May*, 1875, some friends who had known her a long time, told her of the nystagmus. Since that time her sight has continued to get

worse. She has become nervous and restless, and has slept badly; has had much headache, especially in right forehead; and is liable to "confusion of the head," and "so hysterical." The headache has become worse lately, and makes her feel bewildered. When walking in the street she is sometimes obliged to stand still for fear of falling; she does not lose consciousness, but feels as if she could not move. It is doubtful whether these attacks are not due to the nystagmus and defective sight. No tremors or weakness of limbs, and no defect of speech. Memory has not failed. Many years ago, "dropsy" all over her; since then, with the exception of piles and habitual constipation, health tolerable. Still menstruates, but irregularly. Married, and has one son, æt. 20, reported healthy; husband died a year after marriage.

CASE VI.—*Unsymmetrical Choroiditis—History of Diseases of Nervous System in a Brother and Sister of Patient—Evidence as to Hereditary Syphilis negative but incomplete.*

Rebecca H——, 36, married seven months, and pregnant three months. Had noticed defect of her left eye for only a few weeks before admission in *August*, 1876. There was no evidence of syphilis, either acquired or inherited, excepting in the eye.

V. of *left* = 50 Sn. at 20 feet, and not improved by glasses. Slight general haze of fundus (probably retinal); vitreous appears clear. A very large patch of choroidal disease, rather below and to inner side of *o.d.*; its shape is an irregular oblong, and it is composed of coal-black spots interspersed with some white at the centre (her hair is black and irides brown). It has every appearance of having been in its present state for years.

Right healthy.

She had for years been subject to bad headaches at the top of the head, but they had ceased since marriage. Never any fits. Many years ago was severely poisoned by some arsenical wall-paper, and not expected to live. Two others, young children, not related to her, but in the same house, were affected.

Father died rather young. Mother lived to 71. There were 8 pregnancies.

1 (m.), died, æt. 18. Was an idiot, and subject to fits all his life. Not paralysed.

2 (f.), æt. 43.

3 } died young, of small-pox.
4 }

5 (f.), æt. 40. Was for eight months in Hanwell Asylum, after her second confinement, æt. 33. Has since had several children without a relapse.

6 (f.), æt. 38. Married, and has children. Has been subject to fits since æt. 12.

7. *The patient.*

8. A still-birth, some years after the patient.

CASE VII.—*Amaurosis with Atrophy of Discs and Diminution of Vessels, followed by general Paralysis of the Insane.*

Henry W—, æt. 35, married, a smith. Admitted with the barest p. l. on *April* 26, 1876; can just tell where the window is with each eye. Ps. slightly dilated, but do not expand in the least when shaded; the right is slightly larger than the left. *Left* eye deviates definitely downwards, and a little outwards, but this varies, and sometimes it is simply divergent. Associated movements of eyes appear perfect.

Ophthalmoscopic Examination.—Conditions symmetrical. Gray-white atrophy of discs, with diminution of the retinal vessels. The discs uniformly pale all over, quite clean, and the stippling of *lam. crib.* well seen; slight but definite superficial disturbance of choroid at border of each, especially on yellow-spot side. A small white projection from the inner border of right *o.d.*, possibly remains of neuritic effusion, but more probably congenital. Diameter of retinal arteries diminished by about one-third or a half; veins less diminished. No changes elsewhere.

Detailed examination elicited no other symptoms of ill health, or of nervous disease, excepting that he had slight difficulty in standing when not holding some support. Did not consider his legs weak, but felt rather “rocky” or unsteady. Eats and sleeps well; not too sleepy. Manner reserved and quiet, but intelligent. No constipation.

Sight began to fail six months before admission. The failure had been gradual, and, as he believed, quite symmetrical; in about three weeks from its onset he had become unable to read the newspaper.

For the last six years has drunk a very little beer; for sixteen years previously had been a total abstainer. Until a year ago

(about six months before amaurosis began) had smoked half an ounce a day; since then has diminished it because his work does not admit of it; now smoking only an ounce a week. Once slight gonorrhœa, but no evidence of syphilis. Denies sexual excesses at any time, and does not admit any diminution of power. No history of sun-stroke, or of injury to head or of otorrhœa. No family history of nervous or mental diseases, nor of amaurosis, admitted by him or his mother. Has lost three brothers or sisters from various complaints; others are living. He told me he was unmarried, but I learnt from his mother, after his death, that he had been married since about æt. 20, and that his wife had gone away with another man two years ago. He had no children. It is perhaps, not improbable that, notwithstanding his denial, he had become impotent some time before his sight failed. His mother believed that his wife's desertion was the cause of much inward grief, though he showed no emotion.

He attended for nearly eight months. No pronounced symptoms appeared until *October*, when he became shivery and ill, and had pain in the abdomen for a few days. On *December 19*, there was "decided incoordination in walking, and considerable difficulty in standing with the feet together. He sways about, and has to balance himself." Movements of eyes still perfect, excepting the slight divergence of left. His manner and expression had become rather vacant, but I attributed this to his blindness.

In *January* last, he became subject to repeated "shivering fits," and would creep near the fire. His legs, too, "would sometimes fail under him, and yet he was not paralysed." In *February* he became insane (melancholy), and was sent to the Brookwood Asylum, where he died under the care of Dr. Brushfield on *March 5*, from general paralysis of the insane. Dr. Brushfield has kindly given me the results of the *post mortem*; the membranes were thickened, the arachnoid being quite opaque. Considerable subarachnoid effusion and the ventricles dilated with fluid. The brain presented a peculiar pale and sodden appearance and its substance throughout, but especially the cerebellum, was softened and disorganised. The optic nerves were atrophied. No trace of tumour.

There had, throughout his attendance at the hospital, been a

complete absence of ataxic pains, of pins and needles and numbness, and of subjective tightness either around the abdomen or across the nose. The last time I saw the man (in December), I thought from his gait that he was becoming ataxic. He had no delusions or exalted ideas while under my care.

There was not during his attendance at the hospital any marked alteration in speech or tremor of the lips and tongue. He sometimes answered slowly, and his countenance had a heavy vacant aspect, partly from imperfect closure of the lips; but he answered all questions clearly and accurately. Not improbably a specially skilled observer would, however, have detected some defect in these particulars.

CASE VIII.—A case of slight and variable Amblyopia with occasional Diplopia—Tremors, Vertigo, thickness of speech and weakness of legs—Intolerance of tobacco and alcohol—Slow advance of the symptoms—Diagnosis; Cerebro-spinal disseminated Sclerosis.

John C., æt. 47 on admission, a stonemason, has been under care at intervals since *October*, 1874, for varying defects of sight, accompanied by other nervous symptoms. The prominent facts in regard to all his symptoms have been rapid onset, and more or less complete recovery, followed by relapses. The chronological order of events has been about as follows:—

At the end of September, 1874, four or five weeks before I first saw him, while reading the paper one evening, he suddenly complained of headache. Went to bed, and next morning “could not see to judge a stone,” and “could not see across the road,” having been able to see perfectly the day before. Improved in two days enough to allow of resuming work, but did not recover perfectly.

On admission, October 10th. Pupils small, and “eyes very restless;” reads 4 J. with each. No disease of discs or retina visible. In left eye two patches of old choroidal disease, with rounded sharp outlines and much black pigment on a greyish ground, between disc and yellow spot, but above; one as large as *o.d.*, the other much smaller.

Manner peculiar; he seems half-asleep and muddled as if half-drunk; yet is nervous and replies in an irritable, querulous manner. Has always been nervous, but this and the irritability

have increased of late. Appetite good. Has slept well till within the last week or two. Tongue whitened and fissured. Married, but wife never pregnant. Had gonorrhœa 25 years ago; no evidences of syphilis excepting old choroidal disease in the left eye and the condition of the tongue. Some years ago drunk beer and spirits heavily. Has smoked largely (half-an-ounce of shag a-day) for 25 years. A small puny-looking man, of spare habit, with black hair and rather sea-weedy complexion.

Ordered 5 grain doses of iodide of potassium three times daily, and told to leave off smoking, though I did not look upon the case as an ordinary one of tobacco amblyopia.

The urine, tested twice in November, contained neither albumen nor sugar.

November 18.—Worse again since yesterday. V. to-day = 6 J. 28th.—V. = 4 J. *December 5th.*—V. = 2 J. easily. 19th. The same.

He then went to work in the country till end of *April*, 1875, when he returned to London.

On *May 1st* he came to be seen. "V. = 1 J., with some difficulty. Health good." Remained perfectly well till about middle of July, when his wife died unexpectedly, and he was much upset.

August 7th.—V. = only 6 J. with each separately. Attributes this relapse of amblyopia to shock above-mentioned. Since the beginning of the year has again been smoking a little (about half-an-ounce a week), but V. remained unaffected till the above event. *Ordered* bitter mixture.

14th.—Complains of frequent variations of sight; it sometimes varies every two or three hours while he is at the same piece of work; it is always worst in the evening. It seems to depend on failure of accommodation. V. to-day each eye = 1 J. slowly, p. 12", and $\frac{2}{3}0$; not H. m. $\frac{1}{5}0$. Ordered + 36 glasses.

Now ceased attending for more than a year.

October 17th, 1876.—Sight again failing for the last fortnight. Has never quite left off smoking since he resumed it in January, 1875. No trouble or worry lately. Manner as at first.

November 4th.—Still complains of variations in the sight.

11th.—V $\left\{ \begin{array}{l} \text{Right, 6 J. at 12'' and } \frac{2}{4}0 \text{ or } \frac{2}{5}0 \\ \text{Left, 10 J. and } \frac{2}{5}0 \text{ badly.} \end{array} \right.$

Ps. active. Complains of occasionally seeing double, but cannot give an accurate account of it.

Ophthalmoscope.—*Right o.d.* probably healthy, perhaps slightly gray on yellow-spot side. *Left*, decided pallor and atrophy, on yellow-spot side. Is at work, and earning full wages. Iodide and nux vomica in small doses.

18th.—“On 16th had to leave off his work on account of bad sight. Yesterday it was well again, and to-day remains well. The work was exactly the same as usual. Says he had double sight for distant objects. Movements of eyes now perfect in all directions, excepting that there is slight defect of convergence.”

December 16th.—Has had no more attacks.

May, 1877.—Remains pretty well in his own opinion; but is liable to frequent attacks of giddiness. Has not lately had any attacks of diplopia or dulness of sight. He is more tremulous and complains, when asked, of considerable weakness of legs, shown by soon tiring at work or when walking. Manner much as before. I may note here that I was often in doubt whether his quasi-drunken manner was partly the result of alcohol or wholly due to his disease. Sometimes he admitted that he had had some drink, but added that he was now affected by such a small quantity that he scarcely knew how to drink little enough; the last time I saw him he said that a glass or two of beer would now make him nearly drunk, and that he had almost given up taking it.

CASE IX.—*Localised Exudative Choroiditis with Retinitis near Y.S. in one Eye only, and accompanied by Keratitis Punctata—Recovery of nearly perfect V., with partial Atrophy of Choroid—Patient a delicate lad, æt. 17; Family Gouty and probably Tuberculous—Possible influence of Toothache.*

Thomas H., æt. 17, a shoemaker's apprentice, came on *December 11, 1876*. His right eye had, as he believed, begun to fail two or three days before, without pain or other symptoms. There had been some toothache in the carious right upper central incisor for a few days before the dimness was noticed.

V. { Right, 8 J., barely, not nearer than 12—14'', and $\frac{2}{20}$.
 { Left, 1 J. well, p. 4, r. 12'', and $\frac{2}{20}$.

Ps. active, but right remains always larger than left. Movements of eyes perfect.

Right Eye.—Numerous very minute dots on posterior surface of cornea, in its lowest half only; no haze; no congestion; no iritis. *Vitreous* clear. *O.d.* very pale and hazy, the haze extending for some distance into the retina, especially inwards and outwards; some of the smaller vessels partly veiled but the larger ones all clear. Retinal veins too large, especially the (real) lower one; arteries, n. Close to the *y.s.*, rather below and to its (real) nasal side, a large patch of bluish-white effusion, most dense at the centre and thinning off at the margin; it is crossed near its centre by two small retinal vessels which are quite unobscured, showing that the overlying retina is clear. No pigment disturbance around this patch. Refraction on the patch = $H_{\frac{1}{2}\frac{1}{4}}$; at another part of retina, equally distant from *o.d.* = $H_{\frac{1}{4}\frac{1}{8}}$ at most; thus the patch is slightly swollen. *O.d.* not much swollen. No hæmorrhages, nor any patches of effusion elsewhere. The patch might be taken for a choroidal tubercle, but is bluer or less yellowish than the recent tubercles I have seen during life.

Left eye, fundus n.

Urine.—No albumen and no sugar.

He took iodide of potassium in 5 grain doses three times a-day, and a mercurial pill once a-day, containing 2 grains of gray powder, until the end of *January*, 1877 (eight weeks), without salivation or other disturbance.

January 20th, 1877.—*Right eye*, V. = 2 J. at 6" slowly. The patch now sharply circumscribed, and the haze of retina and *o.d.* has disappeared.

April 25th.—V. right, 1 J. r. = 14 inches, as left 1 J. easily, as with left well.

Occasionally notices a little spot in the middle of the right visual field, but on trial no scotoma can be found to-day. The seat of the former effusion is now represented by an area of partially atrophic choroid considerably larger than the *o.d.* Over the greater part the atrophy is incomplete, and the appearance seems caused by denudation of the pigment epithelium, with here and there little pigment heaps; the centre is whiter, and indicates more complete atrophy. *O.d.*, slightly pale; retinal vessels n.

If the pigment epithelium is removed or seriously disturbed

over the whole patch it is difficult to understand the absence of a large nearly central defect of sight. It may be suggested that the appearances are due to various degrees of atrophy of the choroidal stroma, such as would probably occur after caseation and absorption of a tubercle in the choroid if the patient were to live long enough. In such an event the choriocapillaris and retinal epithelium might escape with little or no damage.

The personal and family history gave no definite clue to the cause or nature of the disease. There was no reason whatever to suspect acquired syphilis. No evidence of hereditary syphilis in the patient, but the family history suspicious. Patient was very delicate and undersized until about three years ago, when he began to grow fast; he is now slightly built, of moderate height, with fair hair, and he looks delicate. Is not known to have had any illnesses, is not subject to epistaxis. Believes he had a slight blow on the right eye about six months before it failed. Masturbation denied. Mother married at 18, had 9 or 10 children, and died at 40 of "consumption." Father married at 21, and died soon after 40 from "liver disease caused by drink;" he is known to have had several attacks of gout in his toes. Of the 10 children 3 are living; one (f. æt. 32), another (f. æt. 28), and the third the patient. The two or three eldest and several born subsequently died at from one to three years old of "water on the brain." The patient is about the youngest. Thus the history, though suspicious of syphilis, points quite as strongly to tubercular disease and gout.

CASE X.—*Localised exudative Choroiditis at Fundus of one eye, implicating overlying Retina, and leaving Absorption Patches comparable in appearance to Herpes Scars—Recovery of nearly perfect V.—Relation of the Choroiditis to Retinal Vessel—Patient, a girl æt. 14, Strumous—Possible influence of over-use of eyes.*

Alice W., æt. 14, admitted in October, 1876, with dimness of the left for the past two weeks, and asthenopia of both from too much needlework. Slight H. was found, and she was ordered + 40 spectacles with benefit.

In the left eye, at some distance from the *o.d.*, below and

rather to its nasal side (erect) was an extensive, recent, exudation patch obscuring a large descending retinal vein; the disease had the appearance of localised retinitis, the underlying choroid being hidden.

Several months later I saw her again. She was getting on fairly well at millinery work with her + 40. V. right 1 J.; left 1 J. barely.

The character of the changes in the left fundus had now completely altered. All haze of the retina had cleared off, but the corresponding part of the choroid had undergone pronounced atrophic changes extending through its entire thickness; the retinal vein, which had at first been obscured, running across the middle of the diseased area. The choroidal atrophy was arranged in two rounded patches joined by an isthmus, and so having a sort of figure of 8 shape, the head of the figure being the smaller and nearer to the *o.d.*, the lower patch being about as large as the *o.d.* itself. On closer inspection the diseased area was seen to be composed of numerous much smaller round spots, which, having become more or less confluent, had together given rise to the above figure. Each spot was about twice as wide as the overlying retinal vein. There were no separate or outlying spots, all were clustered close together. The individual spots could be distinguished as being separated from each other by collars of pigment, more or less distinct, and the whole appearance reminded one rather forcibly of a patch of minute herpes vesicles. Here and there a large choroidal vessel could be seen crossing some of the spots, but the white sclerotic was well exposed over the greater part of the diseased surface. No changes elsewhere.

She is strumous, with thick nose and very sluggish circulation; liable to soreness inside the nostrils, and suffers very much from coldness of hands and feet; cheeks very florid and patchy. Not liable to herpes labialis. She is the third in a family of six; no signs of hereditary syphilis. A short time before the eye failed she had been apprenticed and begun to work hard at millinery; this had brought on the accommodative asthenopia noted above, but there had been no other symptoms, nor had the left ached more than its fellow. She had not caught cold or been out of health when the eye failed. Both parents living and reported well, but residing at a distance and not seen.

CASE XI.—*Central guttate Choroiditis followed by well-marked changes in Optic Discs—Case under notice 16 months—The Amblyopia preceding the changes in the Discs and not increasing when they appeared—Patient senile, and for years a considerable beer-drinker—Attack of Apoplexy followed by Mental Derangement.*

James H., æt. 58, a traveller, admitted in *January*, 1876. A man of large frame and of good muscular power, but very gray, and aware that his memory was failing; acne rosacea of nose and cheeks. Sight had been failing for three months, and he dated it from his wife's death.

V. with each eye = 16 J., and with + 10 or + 8 = 10 J. slowly; cannot see 200 Snellen at 20 feet. *Ophthalmoscopic changes*;—The conditions are symmetrical, with slight differences, and the changes confined to the region of the *y.s.* In the *right* are some small, dull whitish or yellowish dots scattered over the region of the *y. s.*, but more at its circumference than close to the *fovea centralis*; easily overlooked by indirect examination. In the erect image they are approximately circular, and surrounded by a decided, though slight, collar (often incomplete) of pigment. In the *left* are two or three little groups of spots like the preceding, but placed between *o.d.* and *y.s.*, the latter part itself being free from them. In this eye the groups are composed of spots which are more or less confluent; they are whiter than those in the right, and perhaps rather more pigmented; there are, however, a few quite isolated, one being bright white and another a minute black dot. *Discs* perhaps very slightly hazy; no pallor and no cupping; retinal vessels normal. *Urine* pale, nearly clear; no albumen.

April, 1877; he considers V. just the same; with his + glasses *right* = 10 J. barely; *left* = 10 J. tolerably well. *Ophthalmoscopic appearances*:—The spots in the right appear to have increased in number, there being now several little groups, each composed of two or more single dots which have become confluent, and at one part there is denudation of the pigment epithelium over a rather large area containing several of these groups. In *left* they are not quite so abundant. In neither eye are there many singly isolated dots, nor do they extend to the nasal side of the disc. *Discs* both pale; the *right* is quite decidedly pale all over, but more so towards the *y.s.* and the sclerotic sheath easily seen;

in the *left* the pallor is less marked on the *y.s.* side and scarcely present at all on the nasal side; retinal vessels normal. Thus the choroido-retinal disease appears to have increased somewhat at least in the right eye, while the discs have certainly undergone marked change, without any appreciable increase of the visual defect. On both occasions the pupils were dilated with atropine. Refraction hypermetropic.

He had through life had good health. Nothing in the family history threw light on the case. No reason to suspect syphilis either remote or recent. Some years ago had an attack of inflammation of both feet, which he took for gout, but has had no recurrences. Fond of beer, and in his trade obliged to take it freely, but has seldom if ever been drunk; has not drunk spirits. Is a smoker. In *March*, 1876, soon after admission, he had an apoplectic fit while at stool; was unconscious for about a day, and "out of his mind" for several weeks. After this he had "rheumatism" in the left shoulder, much pain in the bone; it did not affect any other parts. Had no paralysis after the fit, and considers his recovery to be perfect, with the exception of an increased weakness of memory. He is, however, now (*April*, 1877) decidedly feebler and older looking than before the attack. His radial arteries are not tortuous or hard.

CASE XII.—*Guttate Choroidal Disease in the Y.S. region in an elderly woman—Nuclear and Posterior Polar Cataract of this Eye and nearly complete Cataract of other.*

Isabel G., æt. 59, admitted in *November*, 1876. *Right* cataract nearly complete; V. = fingers at 12 inches. *Left* V. = 14 J. barely at 12 inches; + 10 = 6 J. fairly well; after dilatation of pupil by atropine,—some nuclear haze, and considerable patchy opacity at posterior pole of lens; some little dots of whitish choroidal disease between *o.d.* and *y.s.* Complete examination impossible, from the state of the lens. Urine free from albumen. Is still under care, and the amblyopia has advanced but very little.

CASE XIII.—*Choroidal Disease with pale Discs in an old Woman—Peculiar dotted Cortical Opacities in the Lenses.*

Elizabeth C., æt. 77. Her sight had been for about a year as defective as on admission. She had in her time done a great deal

of fine work. V. right 15 J.; left 20 J., and 70 Sn. at 20 feet. Pupils fairly active. After atropine, focal light revealed a number of small round dots of opacity in the cortex of each lens; they were not white, but of a duller tint. *Ophthalmoscopic examination* showed an area of choroidal disease in each *y.s.* region, larger and more marked in degree in the left than the right. The morbid changes had produced an ill-defined mottling or coarse pepper-and-salt appearance, which, on closer inspection, was resolved into little whitish patches or spots separated by small irregular accumulations of pigment. There were no peripheral changes. Optic discs slightly pale.

CASE XIV.—*Superficial changes in Choroid, or in the Pigment Epithelium, near O.D. and Y. S. in an old woman—Posterior Polar Cataract of same Eye, and complete Cataract of other.*

Sarah B., æt. 65, came under notice in August, 1874. The condition of her eyes when admitted was as follows:—*Left V.* = shadows; mature white cataract, believed to have been coming on for a year. *Right V.* failing about two months; with her + 11 glasses = 10 J.; *after atropine*;—slight general haze and decided opacity of posterior surface of lens, especially at the pole; *o.d.* surrounded by a dusky ring; choroid remarkably patchy, large areas of it being of considerably lighter colour than others, but no spots of pigmentation or absorption. The *y. s.* region was obscured by the polar opacity of the lens. The evidence of choroidal disease here was but slight, and it may have consisted merely in senile atrophy of the pigment epithelium.

She remained under care for more than a year, the cataract in the right advancing slowly. When last seen she was barely able to work, but was averse to operation.

CASE XV.—*Amblyopia coming on in association with Paraplegia many years ago—Recovery from the Paralysis—Amblyopia stationary, with incomplete atrophy of Discs, and a spot of central Choroiditis in one Eye—Patient smoking throughout—Symptoms attributed to nervous shock.*

Edward B., æt. 55, formerly a soldier, now a traveller in the paper trade, came for advice March 15th, 1876. Intelligent, nervous, and fussy (a bad witness), very gray, and looking several

years older than he is, but still strong and active. A smoker, but does not drink enough to cause symptoms. No history of syphilis, but once had gonorrhœa. His father and a brother reported to have had gout; he himself has had neither gout nor rheumatism.

The history of his amblyopia was difficult to get accurately, but appears to have been substantially as follows:—He served in the Crimean war, and had slight “fever and ague,” but his health was not broken by it. Remaining in Constantinople after the war, the house in which he lived was burnt down in the great fire, and he was much frightened. After this, and as he says, in consequence of the fright his legs were paralysed and he was obliged for a time to go about on crutches, but in the end recovered perfectly; there was no numbness nor any affection of the sphincters. During the paralysis his sight failed. His account is not definite, but it appears that both eyes failed together, that the amblyopia reached its height in a few days or weeks, and that it had ever since remained stationary. He came to the hospital because advised, and not from any recent failure of sight.

On admission V. (without glasses) each separately = 16 J. slowly at 6 inches, and 200 Sn. at 20 ft. H.m. $\frac{1}{30}$ = 100 Sn. at 20 ft. With +11 reads 8 J. slowly at 6 inches. Ps. do not dilate fully with atropine, and the left becomes oval upwards.

Ophthalmoscopic Examination.—Media clear. Discs pale all over, but much more so on *y.s.* side where the stippling of the *lam. crib.* is very evident. Retinal vessels normal. In *right* eye, between *o.d.* and *y.s.* a single, small, oval spot of whitish choroidal disease exactly resembling the spots in Case XI above described; it is slightly pigmented on one side (? shadow thrown by an elevation). No other spots in this eye, and none in the other; no disease in any other part of the fundus. Repeated and very careful examinations confirmed the above description.

May, 1877. V. exactly the same. Is better in health and less nervous, probably from improved circumstances. Smokes a quarter of an ounce a day. Hands still somewhat tremulous. Drinks only an occasional glass of beer.

The questions in connection with this case are—

1. What was the cause of the paralysis, and the relation between it and the amblyopia?

2. In what relation does the spot of choroidal disease in the right eye stand to the atrophy of the discs?

In regard to the first, while noting his own impression as to the effect of the fright, it is to be observed that he was an unmarried discharged soldier of nervous temperament, and (judging from his manner) probably of licentious habits. It is not unlikely, therefore, that the sexual system may have had a share in the production of his symptoms. There was no history of sun-stroke. The influence of tobacco in this case is at least very doubtful, although I believe there are some who suspect that this poison may have a definitely injurious influence on certain other parts of the nervous system than those connected with the optic discs.

It is impossible to reply to the second question on the basis afforded by this case alone. Supposing it granted that the presence of the single spot of choroidal disease in one eye is not a mere coincidence, we have the evidence afforded by the preceding case (No. XI) that partial atrophy of the discs may follow the guttate disease of the choroid. The want of a constant relation between the two events is puzzling. Do the punctate changes in the choroid at the fundus stand in any connection with disease of the short ciliary arteries which enter the eye in the neighbourhood of the disc? and may certain senile changes in these arteries be associated with similar processes in the branches which nourish the optic discs?

CASE XVI.—*Extensive Choroidal disease with opacities in Vitreous in one Eye—No cause ascertained—Failure described as recent and accompanied by much pain—Other Eye Leucomatous.*

Anne M., æt. 60, came to the hospital on *April 7th*, 1874, with the complaint that her right eye had been failing for 5 months, previous to which time she could see to sew with it. She said that she had had great pain in it when the failure began. The pupil was motionless; T. n.; cornea clear; V. barely shadows. The other eye was much damaged by a large old leucoma, the result of ulceration.

On examining the right, after atropine, I found many large floating opacities in the vitreous, together with numerous very large patches of atrophied choroid, on which there were slight accumulations of pigment; the eye oscillated, and the details of the fundus could not be satisfactorily seen, nor did I ascertain the refraction. It seemed probable that the recent failure was due chiefly to the opacities in the vitreous. I did not succeed in getting any evidence as to the cause of the choroidal disease.

CASE XVII.—*Extensive disorganisation of Choroid in Yellow-spot region with opacities in Vitreous of same Eye—Sudden onset—Probably Choroidal Hæmorrhage.*

Jacob W., æt. 43, a gardener, stated that in *July*, 1872, his *left* eye became "blood-shot," slightly painful, and very dim; he considered that the sight continued to get worse for about 6 weeks. He then had advice at an ophthalmic hospital, and the sight began to improve. Finding the distance too great, he came to the South London on *January 11th*, 1873, when it was found that the left vitreous was so cloudy that the fundus could not be seen. For the next 2 months he took iodide of potassium with citrate of iron. On *March 15th* his vision with right = 1 J., with left = 6 J. Ophthalmoscopic examination of the *left* showed many very thin floating films and minute dots in the vitreous; and at the fundus, rather above the yellow spot, a large area of atrophied choroid, the stroma being atrophied, but not quite equally in all parts; the entire patch was of irregular shape, its boundary everywhere sharply defined, and in many parts forming portions of a circle. On one part of the atrophic area were two or three coal-black blotches of considerable size and irregularly stellate shapes; the remaining, and much the larger, part of the diseased area was free from pigment, excepting a slight sprinkling or dusting of minute dots here and there. There were no signs of past or present iritis. The vitreous still remained cloudy 3 months later (*June*), since which he has not attended.

With reference to cause in this case we can only speculate. My notes are unfortunately deficient in containing no reference to syphilis, but the history and appearances are very unlike disease of choroid or retina due to that cause. His account was

that the dimness of sight began on the evening of a hot day when he had been working with a threshing machine; he thought at first that something had blown into the eye. When at its worst the sight of this eye was so bad that he could not see people. A large hæmorrhage into the choroid breaking through into the vitreous is the most likely explanation of all the symptoms and changes.

CASE XVIII.—*Disease of Vitreous and of Retina and Choroid near Y.S. of one Eye only—Probably indicative of previous Hæmorrhage.*

Daniel C., æt. 67, admitted *July*, 1875. V. *right* = 16 J.; + 40 = 100 Sn. at 20 ft.; *left* not 20 J. *Right*, commencing nuclear haze of lens and some opacity in the anterior layers; fundus obscured, but, so far as it can be seen, appears healthy. *Left*, no opacity of lens; a few small, sharply defined opacities in the vitreous; some minute white dots (probably retinal) in the *y.s.* region, and above the *o.d.* (in real position) a large area of indefinite pigmentation situated beneath the retinal vessels.

The appearances here were such as might have been left after a large hæmorrhage, and the want of symmetry is another point in which the disease in this case differed from the previous series (Nos. XI to XV). He only came once.

CASE XIX.—*Permanent and very pronounced Retinal Changes in one Eye of an old woman; probably following extensive Hæmorrhage at the Y.S.*

Hannah P., æt. 77, has central whitish-brown opacity of her *right* cornea of many years' duration, and preventing a view of the fundus. About 3 years before admission the sight of the other (*left*) eye failed rather quickly. She gave the history of some inflammatory symptoms. After the use of atropine I found in this eye some striæ in the anterior layers of the lens. The *y.s.* itself was occupied by several rounded, reddish-black spots of large size; these were bounded towards the *o.d.*, and above and below, by a wide crescentic tract of bright white deposit, which could be seen at its margins to be made up of innumerable, small, round dots, while its central parts seemed almost homogeneous. This horse-shoe of white was open towards the temporal

side. The *o.d.* itself was unaltered. She had for many years had a bronchocele. I saw her only once; but a year later heard that she was in good health, and her sight about the same.

CASE XX.—*Changes left by past Neuro-retinitis, probably caused by Erysipelas invading the Orbits—Patient an old woman.*

Susan C., had severe erysipelas of the face, the eyelids being closed by the swelling, when *æt.* 62. Up to the date of the attack she could see to thread a needle, but ever since recovering from it her sight has been so defective that she has done scarcely any needlework. It remains uncertain whether the amblyopia reached its maximum immediately, or whether it has continued to progress ever since.

August, 1875. It is 3 years since the erysipelas. Her memory is bad, and it is uncertain whether there has been any recent failure. V. = some letters of 20 J. with both eyes open; rather better with left. Pupils rather large for her age, and act moderately; they dilate fully with atropine. Media clear. Ophthalmoscopic appearances alike in the two eyes, excepting that the pallor of disc and contraction of retinal vessels was more marked in the right; *o.d.* pale and rather hazy; retinal arteries and veins considerably diminished; *y.s.* occupied by a patch (about one-quarter the area of the *o.d.*) of dark purplish-black pigment, abruptly defined and with little marginal projections, like the rifts which are so often seen radiating from the *macula* in prepared specimens of this region; choroid between *o.d.* and *y.s.* thinned, patchy, and whitish; a few small pigment dots on nasal side of *o.d.* No changes elsewhere.

At an examination six months later the conditions were the same, but I noted that the central veins on the disc were smaller than the arteries. There was no cupping.

The urine contained no albumen. She had had neither fits nor paralysis, but was in a very feeble and senile condition.

CASE XXI.—*Relapsing Hæmorrhagic Neuro-retinitis and Choroiditis, with disease of Vitreous and Keratitis punctata—Only one Eye affected—Remarkable recovery of Sight after repeated attacks—Liability to dimness of Sight of same Eye with Dyspepsia, &c. (? functional)—? Influence of Neuralgia of 5th in determining one of the Hæmorrhagic attacks—Rheumatism and perhaps Gout in family.*

Alfred U., æt. 32, a warehouseman in the leather trade, admitted *December 3rd*, 1873. Black, rather curly hair, thin, pointed features; tendency to acne with congestion, on the face; married, and the father of five children. About 5 weeks before admission a cloud came over the left eye, reaching its maximum in about a week.

On admission. Left eye. Visual field very defective; sees 12 J. barely and 70 Sn. at 20 ft. *After atropine*,—media clear; abundant and widely spread choroido-retinitis. The disease appeared to be of various dates, but for the most part recent. The choroid showed numerous patches, irregular in size and shape, of yellowish, greyish, or dusky colour, with milky haze of the overlying retina; a large irregular patch of greyish or dusky colour occupied the *y.s.* region; *o.d.* hazy, especially at its (real) lower and outer parts. At the periphery of the fundus some small patches of absorbed choroid of old date. The great defect of sight was due to the serious changes at the *y.s.*, much of the more peripheral disease being apparently of much earlier date. I did not at this time suspect the hæmorrhagic nature of the disease, and was not sanguine about the man's prospect. Refraction was tested later, after full use of atropine, and found to be H $\frac{1}{60}$.

Right eye: old corneal nebulæ partly marginal, partly nearly central. V. 4 J. and 50 Sn. at 20 ft. Refraction my. about $\frac{1}{16}$. Careful ophthalmic examinations at various dates never showed a trace of disease in the fundus or vitreous of this eye, nor was it throughout, so far as he knew, ever subject to the attacks of temporary dimness so common in his left. On one occasion, however, the retinal veins at the upper and lower parts of the periphery were very tortuous, and one of them considerably larger at the periphery than near the *o.d.* This enlargement subsided progressively, though rather quickly, at some distance from the *o.d.*

Personal and Family History.—There was no reason to think that he had acquired syphilis in any manner, nor was there anything in favour of syphilitic inheritance. He was of nervous temperament, but appeared steady, and denied having ever given way to sexual abuses of any kind. Never liable to epistaxis. He easily flushed up if nervous or excited. In boyhood he had a severe inflammation of both eyes, lasting more or less for three years, no doubt accompanied by ulceration, and giving rise to the permanent nebulæ on the right cornea. His father had several attacks of "apoplexy," ending in hemiplegia, and finally died of a seizure, æt. 59. Two of patient's brothers have had rheumatic fever severely; one of them (the eldest of the family) is said to have been paralysed on one side during the fever, and now has some defect of his right eye. The only suspicion of gout lies in the history that the father (who was in the leather trade) once had to cut his boot for inflammation of one great toe.

Ordered iodide of potassium and bichloride of mercury, in doses of 5 grains and $\frac{1}{16}$ grain respectively; this made him sick, and in a few days some cinchona was added. On *December 10th* (one week after admission) he thought his sight "much improved." *January 10th*, 1874, he complained so much of sickness from the medicine, that half doses were ordered, and on *28th*, the sickness being no less troublesome, he was told to omit all medicine for a time. The iodide had brought out copious acne on the face. On *February 14th* vision of affected eye = $\frac{20}{40}$, and 1 J. at. 8". The optic disc at this date was clear, perhaps slightly pale, and the retinal arteries I thought slightly diminished; subsequent examination made this doubtful.

I saw nothing more of him until *April*, 1875, when he came at request. At this date (more than two years since last attendance), he could still see 1 J. well with the left eye. *Ophthalmoscopic examination* showed a number of atrophic and pigmented patches of old choroidal disease in all parts of the fundus; several of them were close to the yellow spot. The atrophic patches seemed not to be so numerous as the patches of recent disease had been on his first admission, which would appear to show that some had been absorbed without causing disorganization of choroid. The optic disc and retinal vessels were healthy.

September 29th, 1875.—Applies again, complaining that during the last three months the sight of the left has now and then

become dim for about an hour; near objects look as if in a mist, distant ones remain clear. After the dimness has begun the upper lid droops, and the eye is half shut. Then all the symptoms pass off. It is "like a rush of blood to the eyes." It sometimes comes on after stooping, but sometimes without. The dimness never affects the other (right) eye in which there is the slight, old corneal opacity. Has for long been liable to flatulence; it was quite well while he was under treatment by iodide and mercury; it is a family complaint. Formerly liable to bilious attacks, with vomiting, but of late years nearly free from them; they were not accompanied by headache. The attacks of dimness are not accompanied by either redness or pain in the eye.

At this date V. was good. Right (corneal nebula) = 4 J. Left = 1 J., r. 9".

He took 2 grain doses of iodide with ammonia and cinchona for two and a-half months (to *December 11th*), and double that dose for two months more (to *February 9th*, 1876). During this time his acne improved gradually, and he had no flatulence and no attacks of dimness. About the middle of *February*, 1876, he, however, again became constipated and flatulent, and within a few days had three attacks of dimness. The first of these came on quite suddenly, as he was changing his coat; everything was in a fog, and he "could not tell a man from a woman." The next two were much more brief in duration. He was at this time still regularly taking the iodide in 4 gr. doses.

On *January 8th* I noted that there was decided though slight haze of *o.d.* and surrounding retina, with fulness of retinal veins. The changes in the choroid are for the most part superficial. *February 19th*.—Left eye well again, and reads 1 J. fairly at 12".

February 19th.—The dose of iodide increased to 7 grains, three times a day, and continued till *May 13th*.

March 11th.—Has had severe neuralgia in various parts of the head. No more attacks of dimness. After this date the pain passed into the left upper teeth, especially the wisdom tooth. The toothache made the eye "weak," *i.e.*, dim and unable to open the lids wide; and the dimness remained permanently.

May 13th.—Left slight ciliary congestion; no iritic adhesions, but a number of rather large deposits on the posterior surface of the lower half of the *cornea*, not, however, arranged in a triangle; they are exactly like droplets of cold tallow; a few are confluent,

and dumb-bell shaped. Also a patch of hazy infiltration (not ulcerated) near the outer edge. *Vitreous* full of delicate films. *O.d.* very hazy, and somewhat swollen; retinal veins enlarged, and very tortuous. Numerous large, bright red, retinal hæmorrhages near *o.d.*, the largest being between it and *y.s.* at the lower part, and in contact with a large vein. No hæmorrhages at periphery. The choroidal changes consist partly of round patches, as in typical *choroiditis disseminata*, but many are irregular, and more or less linear. Most of them are unpigmented, but some show a good deal of pigment. In only very few is the choroid completely atrophic, the change in the majority being apparently confined to the retinal pigment epithelium. Some are reddish, as if caused by recent hæmorrhage. Field of vision a good deal broken. This attack threw much light on the cause of the other changes, which were in all probability due to previous attacks of hæmorrhage into the retina, and probably into the choroid as well.

Vision had at the above date already begun to improve a little, and a fortnight later (*May 27th*) was again almost as good as ever, the treatment being unaltered. The corneal deposits had disappeared. Refraction was tested after complete paralysis of A. and found to be H $\frac{1}{60}$.

The *right* eye was never the subject of any attacks of dimness. There was a good deal of marginal and central haze of cornea, as if from repeated phlyctenular ulcers. V. has throughout been = 4 J. and $\frac{20}{50}$; refraction my. about $\frac{1}{16}$. Careful ophthalmoscopic examinations under atropine never showed a trace of disease in any part of the fundus, excepting the enlargement of retinal veins already described (p. 71).

May, 1877.—Has had no further relapse, and has also ceased to be liable to the attacks of temporary dimness. For several months has been losing flesh; is now very thin and pale, and looks phthisical. Has had a cough and "bronchitis," but no hæmoptysis. No family history of phthisis. No symptoms of diabetes.

The recovery of nearly perfect central vision after repeated attacks of disease leaving permanent changes in the choroid and in the pigment layer and other deeper layers of the retina, is most remarkable. The case is of great interest also from the occurrence in the same patient

of serious organic disease of the retina and choroid, and of attacks of transient dimness of sight in connection with dyspeptic symptoms. The patient's statement that these transient obscurations affected only the one eye cannot be taken as proved, particularly as the cornea of the other was cloudy, and I never myself had the opportunity of testing him during one of these attacks. The occurrence of severe toothache in connection with the last attack of retinal and choroidal disease is of much interest, although no conclusion can at present be drawn from it. The limitation of the disease to one eye, and its tendency to relapse, suggest some unilateral vaso-motor disease as the cause, aided by a condition of imperfect recovery of the diseased vessels after the first attack.

ON THE PATHOLOGY OF INCREASED TENSION OF THE GLOBE.

By W. A. BRAILEY, M.D.,

Curator of the Museum.

In attempting to determine the cause of increased intra-ocular pressure, I have examined, microscopically, 53 cases in which this has been at some time a symptom; its presence being indicated either by increased hardness of the globe at excision, or its former existence shown by the pushing back of the lamina cribrosa, as seen in microscopical sections of the disc.

In all these cases, some part of the iris ciliary body or choroid is affected, and it is convenient to arrange them in two great groups, in accordance with the first seat of the disease.

A. Those in which an affection of the iris has been the primary cause of the tension, the disease either remaining confined to this, as in my two cases of buphthalmos, or extending backwards so as to affect the ciliary-choroidal tract secondarily.

B. Those in which the part of the tract posterior to the iris is affected, without any obvious iritic change preceding it.

Group A includes 28 cases. In 26, the iritic affection has been due to perforating corneal ulcerations or wounds with anterior synechiæ; and in 2 cases it has depended on iritis arising probably from some constitutional cause, and resulting in the enlargement of the aqueous chamber characteristic of buphthalmos.

In all these cases there is, first, inflammation of the iris, soon accompanied by increased secretion of fluid.

The inflamed iris forms adhesions to the parts with which it lies in contact; to the lens capsule, in cases of

iritis, without prolapse; or to the cornea at the point of perforation, if the inflammation is due to a perforating wound or ulcer.

It is possible that very slight iritis has preceded many cases which, from an absence of any evidence of its prior occurrence, either from *post-mortem* appearances or from the patient's history, I have arranged under the next group.

The iritic inflammations above-mentioned are generally followed by secondary affections of the posterior part of the same tract.

In the buphthalmos cases, enlargement of the chamber of the aqueous is the most prominent symptom, and with the posterior synechia the pupil is seen to be small and immovable. There is some increase of tension of the whole globe, and a general increase of its measurements. The optic disc also exhibits the indications of increased pressure.

In the cases of iritis after corneal perforation, the cases differ a little according to the size of the area of cornea affected. If this has been small, as in a case of punctured wound, the slight prolapse of iris closes it, and we have increased depth of aqueous chamber, especially of the anterior part, with rapid slight increase of tension of the globe. But if the perforation be large, as in the case of a more extensive wound, more iris is prolapsed into it, and it may be so large that the whole iris is drawn forwards and applied to the posterior corneal surface. Inflammation of iris, with increased secretion, follows, but the extent to which this affects the size of the chamber and the tension of the globe depends on the closure of the wound. In corneal ulceration, the perforation is less, but the surrounding thinned area is greater, therefore we have more easy closing of the leak with yielding of this part of the cornea, thus constituting anterior staphyloma.

Besides the cases above-described, there are many

which would be arranged under this group, of which I see living specimens, but am not likely to have excised eyes. For example, in cases of corneal inflammation, ulceration, or slough, in which the cornea has sufficient clear area, it is often apparent that there is already some slight iritis with increased depth of the aqueous chamber. The occurrence of this increase of fluid will explain the fact that here, as will be afterwards seen, we have the nearest approach of any disease to the *post-mortem* characters of increase of tension. I have not the slightest doubt but that, by an increase of the delicacy of our methods of investigation, we should detect increased hardness of the globe in these cases, and I think that we have thus an explanation of the benefit frequently derived from paracentesis, incision of the cornea, or iridectomy.

Group B includes all cases known usually as glaucoma. In these, there is generally no history of any injury, or if the patient attributes the disease to a blow, it is a non-perforating one, and its connection with the glaucoma is often obscure. Though, as before-mentioned, I cannot altogether exclude primary iritic disease, yet the *post-mortem* appearances refer markedly to great ciliary or choroidal affection.

Of this group I have 25 specimens. In 14, the ciliary region seems the sole part involved. In five there are found patches of choroidal disease, together with the ciliary affection; and in one, the change has been principally manifested in the choroid. In this group I have also included five cases of tumour.

I have no doubt that the proportion of cases of increased tension due to choroidal disease principally, if not entirely, is much larger than the figures above given indicate, but in this class of cases the increase of tension appears to be usually gradual and moderate in amount, and therefore such cases rarely come to excision.

Of the 5 cases of tumour, 2 are choroidal and 3 retinal. In all these cases, though the choroid was impli-

cated and its tissue in places almost entirely obliterated by the tumour growth at the date of excision, yet the ciliary body and iris presented precisely the changes which will be found occurring in all cases of increased tension (see Fig. 2). Therefore, as these parts are not involved in the tumour growth, and as the glaucomatous symptoms do not appear to have come on till long after the tumour has made its appearance, I shall treat the glaucomatous symptoms as indications of an affection of the globe of just the same nature as ordinary glaucoma, and have, therefore, included them under Group B.

It will be noticed that I have considered such cases as anterior staphyloma, buphthalmos, and glaucoma to be all intimately related, only differing in their outward manifestations in the part of the tract of the iris choroid and ciliary body which may happen to be affected; and in the resistance offered to the increasing contents of the globe by its walls.

I shall proceed to discuss, *first*, such symptoms of these three diseases as may be more easily perceived before excision, and, finally, I shall treat of the *post-mortem* appearances.

The size of the *aqueous chamber* varies with the increased or diminished secretion of fluid from the iris. Whether the increase is found in the anterior or posterior part of the chamber of the aqueous, depends on the adhesions of the iris. In buphthalmos and any similar serous inflammations of the iris without perforation of the cornea, the anterior chamber is increased in size, whereas in similar inflammation of the iris occurring after its prolapse into perforating wounds which have subsequently closed, the anterior chamber is very small, or even obliterated, if the prolapse is great; while the posterior chamber is considerably increased. An exception to this occurs in one case of minute perforating wound where the surface of the iris has prolapsed only a little way into the wound and thus closed it. Here the

increased fluid is found especially in the anterior chamber. This is also the case in those cases of iritis with increased secretion that I have observed in unexcised eyes with entire corneæ.

The size of the aqueous chamber also depends somewhat on the age of the patient, and on the mobility of the lens system. The young healthy cornea allows of considerable yielding, so that it becomes enlarged in all directions, and also more convex; but in older eyes, there is greater corneal rigidity and, provided that the cornea be healthy, the main part of the increased space for the aqueous is provided for by the displacement of the lens backwards.

If such cases are examined *post-mortem*, the apices of the ciliary processes are seen stretched considerably backwards. But when the iritis is succeeded by atrophy of the iris, the aqueous is much diminished, or even altogether disappears. Then the pressure from behind reasserts itself and the lens is pushed forwards, in some cases, so much as to be adherent to the posterior surface of the atrophied iris, which, by the disappearance of the fluid in the anterior chamber, has been applied and is now adherent to the posterior corneal surface.

This pushing forwards of the lens more readily happens if, by an extension of the iritic disease to the ciliary body and choroid, there is secondary increased pressure in the part of the globe posterior to the lens. And if this region is affected before or without the iris, as in ordinary cases of glaucoma, the aqueous chamber is shallowed by the increased pressure, though not obliterated, because the iris still retains its functions.

The size of the vitreous chamber is also liable to be affected by increased pressure, but any remarks about this will more advantageously come under the section on hardness of the globe.

The increased hardness of the globe is dependent on an increase of the contents of the globe apparently by

secretion of fluid from the iris ciliary body or choroid, and so bears a close relation to the size of the aqueous or vitreous chambers, and to the amount of increased space that the walls of the globe will allow.

But as the iris is a very small secreting surface compared with the ciliary and choroidal tract, so it must affect the general hardness much less. Moreover, its inflammation is very often in connection with a thinned cornea, or one imperfectly cicatrized after perforation; by the yielding of which increased space is provided. In consequence of this, the tension of the globe is rarely increased in cases of recent corneal ulceration. And it is even diminished, for in cases of extensive ulceration I have seen minus tension with increasing size of the aqueous chamber from extremely ready yielding of the cornea.

But where the iris is affected apart from the cornea, some increase of general tension of the globe occurs, even though the inflammation has not extended backwards beyond the iris. Thus, in my cases of buphthalmos, though the ciliary region and choroid seem healthy, we have some cupping of the disc, and similarly, in many cases of serous iritis which are seen during life, we have plus tension. This cupping of the disc or increased tension, is usually slight on account of the comparative total increase of fluid being slight, and its distribution over both chambers principally by the mobility of the lens system, though there appears, also, to be some intercommunication of fluid between them. Similarly, increased hardness of the globe is connected with general or local yielding of the walls of the vitreous chamber, but it will be best treated of after we have examined the causes and extent of this.

It is obvious that if the increase of the contents of a glaucomatous eye be limited and definite, as in the cases where the inflammation is of short duration, and does not lead to much structural alteration of the parts affected, so

a slight increase of space, or the escape of some of the contents may be sufficient to afford permanent relief to the condition. This is seen in cases in which paracentesis of the cornea permanently cures increased tension, and when after slight general or local enlargement, further increase in size or hardness ceases. The same result is attained if the resulting cicatrix or staphylomatous area allows of the transudation of fluid.

This general yielding of the cornea has already been treated of, and similarly general yielding of the sclerotic is found in all young eyes, and, to a less degree, in adult eyes, in which the tension has been increased. It is seen in the cases of buphthalmos, and also in those young cases in which secondary affection of the ciliary and choroidal tracts follows iritis after perforation. The increase of measurement is seen in all directions, though if the cornea have originally been ulcerated the antero-posterior measurement is the one most affected. But if the disease has affected solely or with especial severity limited areas, then we have atrophy of the sclerotic over the parts affected. If the sclerotic be the yielding one of a child, these parts give to the pressure, and there is relief by the local bulging. As it was said that cases of increased tension are sometimes connected by the patient with non-penetrating blows, so these local thinnings occur more commonly in the parts most exposed, *i.e.*, in the upper ciliary region, though they are found to a less extent elsewhere.

Thinning of the corneal margin, independent of any previous local disease and consequent marginal staphylomata, are by no means uncommon. These, however, are, I think, due to pressure from behind, causing absorption of the posterior corneal surface, as will be treated of subsequently. These corneal marginal staphylomata are generally lined by a web of pigment, representing atrophied iris, through which the pressure is applied. But cases occur in which they are only partially so lined, or even are entirely free.

I have seen cases in which, notwithstanding that the posterior corneal tissue has been thus absorbed, there is no loss of total thickness in this region, as nucleated fibrous tissue has been added on to the exterior to an equal or even greater amount.

But in senile eyes, and particularly in hypermetropic ones, which are in especial the subjects of glaucoma, there is normally a thick and rigid sclerotic, and consequently the symptoms and consequences of increased tension are rapidly developed and very grave.

If, however, the disease be of long standing, scleral atrophy is produced here, though less speedily than in younger eyes. This atrophy may be general, and in one case, though the sclerotic was reduced all over to about $\frac{2}{5}$ ths of its normal thickness, there was still plus tension and no increase of size of the eye, or it may be local, and then dark patches are seen, having the general appearance of local scleral staphylomata. Here, also, the rigidity of the part remaining tends to prevent bulging to such an extent that in one case, though the sclera at the patches was scarcely a third of its normal thickness, with still increased tension, there was no elevation of the thinned areas.

Corneal prominences, after extensive ulceration, probably owing to the altered character of the cornea surrounding the perforation, occur equally readily at all ages, though they are far more common in children, as corneal ulceration, especially such as is followed by cicatrisation of the perforated place, is far more common in them.

Other pathological glaucomatous changes are much better seen in excised eyes, though some of them are capable of recognition before excision. They may affect:—

1. The optic disc.
2. The iris.
3. The ciliary region or choroid.
4. The vascular supply of the globe.

The changes are given as found in the specimens at

my disposal, but among them, I regret to say, there are not any cases of unadvanced glaucoma simplex. Most of them are cases of glaucoma absolutum, but in some of these the disease has been acute, and tolerably recent. I have one case of those I have included under group B in which the outbreak of the disease dates from less than six weeks before excision, but with this exception I have none in which the history shows the case to be clearly of less duration than five months. There are included, however, under this head, cases of increased tension of short duration only, secondary to tumours, in one case the patient being but two months old.

Of glaucoma secondary to iritic disease I have one case seven months after the corneal ulcer had made its appearance, and another ten months after. I have several early cases, in which there is anterior staphyloma still yielding with involved iris, but no apparent increase of tension, and I have examined many times the iris removed in the iridectomy of early cases of glaucoma simplex.

With reference to the symptom of *cupped disc*, I find that in point of time it follows at some distance the increased tension, even where this has been very considerable.

For example, the cup, with five months' history of increased pressure, it being registered as $+ 2$ at excision, is shallow, wide, but not at all undermined at its sides; and the case of less than six weeks' duration presents, with a registered tension of $+ 3$, a deep, though not at all flask-shaped, pit. I find no case with a cup whose edges are distinctly undermined without a history of at least two years. And in many cases with a history of seven and more years, and tension $+ 1$ at excision, the cup is neither deep nor undermined laterally.

While in order to produce a flask-shaped cup it requires a history of several years of increased tension, yet even this duration of but moderately increased pressure is not sufficient, and we have only a wide pit whose central part is usually the deepest.

Though the formation of a cup, and especially one with undermined edges, takes a long time, yet in all the cases in which increased tension has been noted before excision I have found distinct evidence of it in the disc.

The first result of the pressure is a pushing back of the centre of the lamina cribrosa, so that its front surface, instead of being nearly straight as in normal eyes, is markedly concave (Fig. 3). This happens before there is any other naked-eye indication than a small central pit, and can only be well seen in microscopical sections of the nerve entrance parallel to the course of the nerve fibres. There accompanies this altered position of the lamina cribrosa a disappearance of the nuclear tissue, among which the blood-vessels lie in the centre of the disc, so that they are pushed to the sides of a central funnel-shaped, ill-defined, small depression. This extends down as far as the lamina cribrosa, and afterwards enlarges in a lateral direction. If the pressure is never very great, the affection of the lamina cribrosa does not get greater, and further change is limited to a replacement of the nerve fibres in its concavity by nuclear tissue, and the subsequent absorption of this. So that, with only moderate increase of tension, first we have a pushing back of the centre of the lamina cribrosa, with a central pit, not extending down as far as it, then a wider funnel reaching the lamina cribrosa, and then lateral increase, till the inner scleral edge of the optic nerve entrance is almost laid bare, but there is no undermining.

If the pressure is still greater, the lamina cribrosa is pushed back along its whole extent, so that its lateral parts line the overhanging anterior scleral edge of the nerve entrance (Fig. 6). Thus we have here more rapid destruction of nerve fibres than the previous description of the ultimate results of long-continued less tension shows, though, as far as the total destruction of nerve fibres are concerned, the effects are the same.

In a well developed cup the floor is formed by the

lamina cribrosa, which is denser than usual, from its fibres being pushed together in an antero-posterior direction (Fig. 6).

General increase of size of the globe by diminishing the pressure, checks the formation of a perfect flask, and therefore in young eyes of long standing increased tension, discs are more saucer- than flask-like.

Atrophic depressions of the optic disc from absorption of its fibres are much spoken of as symptoms of some forms of disease, and do without doubt occur. But here the lamina cribrosa, though laid bare, retains its usual level. But I suspect that very many of the so-called atrophic cups, as seen by the ophthalmoscope are due to very long continued subacute glaucoma simplex, in which the tension has never been or has ceased to be very palpably beyond the normal.

It is a most important and interesting question as to whether cupping of the disc is preceded by swelling. Certainly swollen discs are found in all cases of inflammation of the iris and its continuations, very closely following perforating wounds or ulcers. And therefore I have no doubt that very many cases of cupped disc are preceded by swelling. But the swelling of the disc may be due to the diminished tension, as the cupping is ultimately to the increased pressure, and so they are both secondary results of other changes, and neither is in itself a primary disease.

Swelling of the nerve entrance due to changes outside the globe may be followed by atrophic cupping.

The after-history of a cup in those old cases in which the tension has fallen either spontaneously or after operation, is a matter of great importance. I have found many such cases in which the depression has been refilled almost entirely by nuclear matter, so that to the naked eye no indications whatever of a cup remained. But microscopical sections show that the lamina cribrosa still retains its depressed condition, though perhaps somewhat diminished

from its original extent. And I believe that in all cases this alone will unmistakably indicate the former existence of increased tension, though it is out of my experience, that some other pathological glaucomatous condition is not found to give confirmation to it.

The *ciliary body* is the seat of the most marked and universal changes occurring in glaucoma. For of those cases included under Group B, it is extensively affected in all but one, and here, even, there is some change. And in those included under Group A, it is markedly implicated in all but the two buphthalmos cases, and the single case of small, rapidly-closing, perforating wound of the cornea, with anterior synechia.

The remaining 49 cases of increased tension present marked ciliary changes, and the one which is present in all, and more distinctly seen in each, than any other pathological condition, is atrophy of the ciliary muscle (Fig. 4). This atrophy is well seen in all, and almost equally in those cases of short and of long duration, provided that the increase of tension has been great in both. It affects in particular the circular fibres, and, therefore, the antero-internal part of the muscle (with relation to the antero-posterior axis of the globe) is the most wasted, and in consequence of this, the muscle, instead of being of its greatest thickness in front, often tapers forwards from a point some way behind its anterior border. This affected part in many cases presents no trace of muscular fibres at all, but in most there are a few thinned ones mixed with a little nuclear tissue and some blood-vessels.

The radial fibres do not escape unaffected. Their bulk is diminished, though to a less degree than the others. And even this does not represent the full extent of the atrophy, for the fibres left are much thinned, especially those forming the central part of the muscle, and here, frequently, they can be scarcely seen at all. In some specimens this condition exists throughout both sets of

fibres, and scarcely a trace of the existence of muscular tissue can be found anywhere.

This atrophy does not find full expression in measurements of the muscular thickness of the front part, both on account of the thinning of the muscular fibres without fully corresponding general diminution of the muscular size, and also from the somewhat fusiform shape of the muscle. Moreover, in many cases, both in healthy and morbid muscles, the antero-internal border extends considerably in advance of the origin of the radial fibres (Fig. 1), and so the thickness of the muscle opposite their origin is somewhat diminished.

This last source of fallacy I have attempted to correct by halving the distance that this part of the muscle thus extends in advance, and adding the result to the muscular thickness opposite the origin of its radial part.

I think that in some cases this muscular advanced position may be due to anterior synechiæ, but in general, if I had altogether neglected it, the ciliary atrophy would have been still more markedly expressed in my figures. I have made no correction for the distance the greatest muscular thickness is behind the radial origin, though this would have still more emphasised the atrophy, but have recorded the greatest muscular diameter wherever found.

A contracting retina, which still retains its attachment at the ora serrata, may apparently increase the size of the muscle, but this disease rarely is concerned in my measurements.

In the three cases under Group A, in which the ciliary muscle is not markedly atrophied, there is in all decided increase of fluid in the aqueous chamber apparently due to disease or injury of the iris with synechia. And though the general hardness of the globe is rather increased, there is no evidence of disease affecting the ciliary and choroidal tracts beyond the iris. In the case of injury, the wound occurred only 14 days before excision, possibly too short a time for the inflammation to have travelled backwards,

In all the other cases of this Group A, increased tension has followed an entanglement of the iris, and the ciliary muscle in each case is found to be atrophied, especially as to its circular fibres, to a degree corresponding pretty nearly with the *amount* of increase of tension rather than to the time of its duration. This is extremely well seen in those specimens with increased tension after injuries, excised on account of their setting up sympathetic ophthalmitis in the other eye. In each of them the iris is found to be entangled in the corneal wound, and the atrophy specially prevails in the part of the muscle nearest this. This atrophy is very early developed, occurring in the earliest specimens in my possession. And as in cases of secondary glaucoma the tension is generally less than in Group B, so we find the average muscular size larger.

In the single case included under Group B, in which this muscular atrophy does not very markedly occur, there is evidence of choroidal disease, and I believe this to be principally the cause of the increased tension. In the cases of glaucoma accompanying tumours of the retina and choroid included in this group, the ciliary region, though unimplicated in the tumour mass in all the cases but one, is greatly atrophied. And it is remarkable to notice that this change is observed not only on that side in closest relation with the tumour, but on the side removed from it. Just as local choroidal disease has been seen to correspond with scleral thinning, so with atrophied ciliary regions of some standing we have diminished scleral thickness. If this atrophy be limited to part of the circle, and the increased pressure be great and the subject not old, relief is found by the establishment of local ciliary scleral staphylomata.

Examining microscopically specimens of other diseases, I find that in old lost shrunken eyes there is an atrophy of the ciliary muscle, but this proceeds *pari passu* with general atrophy of the structures of the globe, and does not affect especially the circular fibres, nor is the muscle

wasted in advance of any other structure. Examining other eyes with normal tension, I find that in old wounds of cornea without iritic adhesion, after iridectomy or cataract extraction there is no atrophy. Similarly, after cataracts of long standing without other affection. Nor is there any found after suppurative iritis or detached retina recent or old. And, even in adhesions of iris to the cornea or lens, independent of perforation, and probably due to iritis from some general cause, no atrophy is found.

But in opacities after corneal non-perforating ulceration, there is slight diminution in size of the muscle, and this is rather more marked in sloughs of the cornea, and the same in a case of epithelioma affecting this region.

In adhesions of the iris especially to the cornea, after wounds or perforating ulcers not followed by plus tension, the atrophy is greater than in the diseases just enumerated, though even here it is below that occurring in the mildest cases of increased tension.

It is very interesting to note that the diseases I have just enumerated as those in which the greatest atrophy occurs, short of increase of tension, are those which are especially liable to be accompanied or followed by increased hardness; and, moreover, that where slight atrophy accompanies synechiæ or ulceration, it is frequently seen to be greatest on the side corresponding to the morbid condition.

It is possible that this atrophy may be the cause of the diminished power of accommodation which prevails long after the disappearance of corneal ulcers.

My reasons then for thinking that this atrophy bears a very close relation to increased tension are—

- (1.) Because it is found only markedly here.
- (2.) Because the diseases in which it occurs to a slight extent, with tension which we cannot with the finger distinguish from normal, are those in which plus tension very frequently comes on later.
- (3.) Because the amount of atrophy of the ciliary

muscle bears a close relation to the amount rather than the duration of the increased tension.

(4.) Because the atrophy in secondary glaucoma follows the iritic adhesion, and precedes in point of time any rise of tension that is distinctly appreciable.

In other cases during life I have seen evidence of this atrophy; in one case, diagnosed as old cyclitis with increased tension, and apparently unaffected iris, bluish patchy thinning of the ciliary region was apparent; in another with increased tension after perforation of cornea and iritic prolapse, the whole ciliary region was thin and bluish.

That this condition is by no means a result of increased pressure is made clear by two cases, one in which, acute glaucoma of less than six weeks' duration, having necessitated excision (Figs. 4 and 5), the upper part of the ciliary muscle is reduced almost to $\frac{1}{3}$ of the thickness of the unaffected lower part of the circle; and the other in which subacute glaucoma occurred in an eye from which a cataractous lens had been extracted through the pupil many years before. Here the upper limb of the iris is adherent to the scar; and the corresponding ciliary muscle is little more than two-thirds the thickness of the part below, and its fibres are thinner. In both these cases, sections of the lower part of the ciliary circle show it to be not far removed from normal measurements (Fig. 5).

Taking the 25 specimens which make up the entire Group B, I find the average thickness of the ciliary muscle to be .361 mm., the average age of the patients 43.6 years, and the mean duration of the disease 4.8 years. If, however, the cases in which the increased tension is due to intra-ocular choroidal or retinal tumour be excluded, as being exceptional in their cause, as well as in affecting a younger class of subjects, the average muscular thickness is .356 mm., with an average age of 50 years, and an average duration of disease of 5.8 years. But if we take the tumours alone, though we find the average muscular thick-

ness to be not very different, being $\cdot 394$ mm., yet the average age is only 15 years, and the duration about 1.4 years.

In nearly all the above cases, measurements of at least two points of the ciliary circle have been taken. Similar enquiries as to four tolerably healthy eyes in my possession yield with an average muscular thickness of $\cdot 8$ mm. an average age of 44 years. Taking again four diseased eyes in which no increase of tension has ever been manifested, there is found $\cdot 84$ mm. for the muscular thickness, and $39\cdot 5$ for the age. The mean duration of the disease is here 19.5 years, but much importance cannot be attached to this, as in one, a case of kerato-iritis, it is as long as 58 years, while in two others it is less than one year.

Examining for purposes of comparison all the 28 specimens of Group A, we have an average muscular thickness of $\cdot 435$ mm., an average age of 31 years, and an average duration of disease eight years.

But if we treat by themselves the three cases in which the iris seems to be the part almost if not exclusively affected, the average size is $\cdot 68$ mm., the age 30 years, and the duration of disease five years.

The question then arises, is this atrophy secondary to inflammation of the same part, or is it primary? And then, if it is secondary to inflammation, is this or the atrophy the cause of increased tension?

In the earliest cases that I have of Group B, I find rather numerous nuclei lying between the muscular fibres and in the tissue of the base of the iris. And this increase can be especially noticed by contrasting the sections of the healthy and the affected muscle where one portion alone of its circle is implicated (Figs. 4 and 5). In the cases in which the tension has been of some standing, the nuclei between the fibres of the muscle are even fewer than normal. And this will account for the fact that being without very early cases, I have none in which the nuclei are *very* abundant.

In early cases of secondary glaucoma (Group A) affecting the ciliary muscle, I find a great increase of nuclei, and this is better seen in the part of the muscle near the affected iris. Later a diminution follows, as in the cases of Group B.

But in other diseases not resulting usually in increased tension, as suppurative iritis and ophthalmitis and wounds of the cornea without synechiæ, this nuclear increase is still more marked; therefore, though increase of nuclei is in many cases a first stage in the glaucomatous process, it is by no means necessarily its cause.

I should judge that some form of inflammation resulting rapidly in atrophy, whether affecting the iris ciliary body or choroid, is the cause of increased tension.

In many cases, increased tension occurs so rapidly, that it is impossible to consider it due to atrophy. This is seen in displacements of the lens whether into the aqueous or vitreous chamber (of which several very interesting cases are given by Mr. Bowman in vol. v of these Reports) and in many cases of punctured wounds of the globe. In these cases it is far more likely that an inflammation of the same kind as iritis serosa, iritis with corneal ulcers, &c., takes place, and that this may subside, relieving the tension and leaving the muscle unaffected, but that far more commonly it continues longer, and is succeeded by more or less complete atrophy. It is possible, however, that in displacements of the lens there may be temporary or permanent loss of function of the ciliary muscle from its being dragged on. But many eyes are excised on account of glaucoma absolutum, the tension being as high as it ever was, in which all traces of inflammatory disturbance of the ciliary muscle are absent from this region and other parts of the same tract. But in these complete atrophy of the ciliary muscle exists, and it is a question in these cases as to how the tension is kept up. Exclusion of the pupil or marginal anterior synechiæ, such as are found in the vast majority of cases of Group B, and in most of Group A, are

without doubt factors in keeping up plus tension; but it is not entirely due to this, for tension with atrophy of the muscle persists in several cases, in which there has never been any peripheral adhesion, and in cases in which this has only implicated a small segment of the periphery of the iris. Moreover, cases occur in which there is peripheral adhesion without any increase of tension. Therefore we must conclude, that though inflammation of the ciliary region is very frequently a cause of increased tension, yet that this is maintained in connection with the muscular atrophy.

In Group A the inflammation and atrophy of the ciliary muscle where these occur are secondary to similar changes in the iris. In Group B, though similar iritic inflammatory and atrophic changes are found, yet it is probable that these in most or all are secondary, but of this I shall treat more fully under "Pathology of the Iris."

The part of the ciliary body on the internal aspect of the muscular fibres contains sometimes larger veins than usual, but in thickness seems not diminished. The ciliary processes are frequently twisted and somewhat atrophied.

I have but one case in which the choroid might be considered as the principal cause of the increased tension; it being in all others much less visibly affected than the ciliary body and iris. In this case the change is simply one of atrophy. I believe that cases of glaucoma due to choroidal disease are not uncommon, and I have recently seen a case in which white patches are visible to the ophthalmoscope with increased tension, but such cases I imagine rarely come to excision. In the other cases in which I have examined the choroid I find usually atrophy more or less extensive.

Changes in the *Iris* in increased tension are very marked, though not so closely connected with it in time as the ciliary atrophy; seeming to precede considerably in many cases the decided increase in Group A, while in Group B they are without doubt secondary.

These changes may affect its position and relations or its structure.

In all cases of Group A there has been iritis as a first symptom. This iritis may be primary, as the iritis which has led to buphthalmos, and in this case the adhesion of the iris is to the anterior surface of the lens capsule. In consequence of this posterior synechia, a very deep anterior chamber is visible in both my specimens, and the pupil is small, fixed, and centric, the adhesion of the pupillary margin being almost or quite universal, and being slowly succeeded by atrophy of the iris.

In the other cases of Group A after wounds and perforating ulcers, as pointed out under the general symptoms of this group, iritis with increased serous secretion either precedes or is due to the prolapse. If the perforation is small it soon becomes closed, and we have simply a point-like anterior synechia, but if large, much iris prolapses, frequently even the whole pupillary margin. Serous inflammation of the iris is set up, its periphery becomes adherent to the periphery of the cornea to which it is applied, and the remainder of the iris generally lines the cornea between the adherent base and pupillary edge, taking on the exact shape of its posterior surface, and finally becoming adherent there. Atrophy rapidly succeeds and finally no trace of iris is left but a web of pigment closely adherent to the posterior corneal surface. The anterior lens surface, at first far removed from the iris by increased fluid in the posterior chamber, is pushed forward as the iris atrophies, and finally becomes adherent to the web of pigment.

In the subacute and aphakic cases of Group B, the iris is free from synechiæ, as it also probably is in all *early* cases of glaucoma of this group, so that it remains free and mobile and is unatrophied. But in the great majority of my specimens its periphery is bulged forwards and outwards so as to line the rim of the anterior chamber of the aqueous (the space of Fontana) (Figs. 2 and 4). It is ap-

plied for a little way to the posterior surface of the periphery of the cornea, but again becomes free to the pupil. This condition of things may exist for some time, the pupil being dilated and only imperfectly mobile owing to this position of the iris margin, and centric or eccentric according as the adhesion exists only on one side or equally all round. Now if the fluid be allowed to escape from the aqueous chamber, as in paracentesis, the iris will regain its normal position and mobility.

But more frequently the applied surfaces become permanently united owing to inflammation, as evidenced by increase of the nuclei of the iris affecting especially its base and anterior surface.

The adherent part rather rapidly atrophies and sometimes is reduced to a mere web of black pigment on this part of the cornea. The free limb also atrophies but vastly more slowly, and the anterior surface, from its previous inflammation, contracts and rolls forward the part of posterior surface nearest the pupil, so that its pigment presents at the pupillary edge and is seen in front. In one specimen which I have the iris is thus rolled on itself like a scroll, and was not at visible all during life.

In this group, B, the inflammation of the base and anterior surface is probably secondary in time to the ciliary disease, which is here the principal symptom; at all events, it is distinctly so in one case in which the iris lines the rim of the chamber, but is neither inflamed nor adherent. But I will not say that it never is primary, and thus the starting point of the glaucoma.

This peripheral adhesion of the iris is extremely common, occurring in all my cases of Group A, except the buphthalmos cases and the case with small anterior synechia after a wound, and in Group B in all but three cases, though in two more, only one part of the iris is thus adherent and the rest free; while in another, one part, though not yet adherent, lines the rim of the chamber.

The atrophy of the adherent periphery always suc-

ceeds, though it varies very much in degree, according to the length of time that the adhesion has existed. It is very slowly followed by atrophy of the free limb.

It has been before noticed that inflammation of the iris causes increased aqueous secretion and its atrophy a diminution of the fluid. This last condition, together with the increased pressure from behind, is the cause of the shallowness of the aqueous chamber which occurs in most cases of glaucoma.

This peripheral adhesion of the iris, though found in 25 out of 28 cases in Group A and in 22 out of 25 cases in Group B, is not the cause of the increase of tension, as has been maintained by Dr. Max Knies in a very able paper, both from the buphthalmos cases quoted above and the other case of Group A with increased size of anterior chamber; for in all these the margin of the iris is widely removed from the cornea, and also from a case in which universal peripheral corneal adhesion of the iris is found after old kerato-iritis, there being no evidence of plus tension in the disc, and from another case in which a marginal corneal wound has caused a corresponding local peripheral adhesion without increase of pressure, and from yet another in which permanent peripheral adhesion, after corneal perforating ulcer, was followed by an extremely slight increase of tension, which subsided spontaneously.

Notwithstanding all this, these adhesions have, without doubt, great effect in keeping up an already established increased pressure, for in the examination of four glaucomatous eyes, in three of which iridectomy and in one iridectomy and subsequent sclerotomy have been performed without relief of the tension, I find that, with but one exception, the periphery of the iris has been left as a more or less atrophied layer still adherent to the cornea. In all these three cases with adhesion left, the ciliary muscle is much atrophied, but in the other one there is much inflammatory disturbance, but also a diminution in size of the ciliary muscle. In this case, notwithstand-

ing the removal of the iris right up to the periphery, the increased tension has returned.

I have moreover observed many cases during life in which plus tension has existed with a centric and mobile pupil; the iris when examined after iridectomy showing no signs of atrophy, in which iridectomy right up to the margin failed to produce relief of tension; as well as many others in which the margin was left adherent, with the tension unrelieved.

From the cases cited, I am inclined to the belief that if the affection of the ciliary body or choroid has run on to atrophy, then iridectomy will permanently relieve the hardness, but that if the increased nuclear condition still persists it will fail to give relief.

The cause of this application of the periphery of the iris to the rim of the aqueous chamber seems to be an increased flow of fluid from behind the plane of the lens, issuing somewhere between the ciliary muscle and the periphery of the lens, for as before said, in aphakic cases, where the communication is widely opened, and in sub-acute cases where the flow is slight, this condition does not exist. It is clear that the cause is a mechanical one from the case in which the iris is applied, but non-adherent; and I do not think that the advance of the lens will account for it.

That the iris seems not to allow the passage of fluid through it, from its posterior to its anterior surface, seems to derive confirmation from the fact that when the iris prolapses into a corneal perforating ulcer or wound, this ceases to leak if the iris is large enough to fill it completely, and we have anterior staphyloma following; and also from the bulging forwards of the iris between its pupillary edge and its periphery, frequently seen with exclusion of the pupil. In the same way I think the increased pressure bulges the iris forwards in glaucoma.

Being thus applied or united to the periphery of the cornea, it will prevent the transudation of fluid in this

region, and as the conjunctiva here leaves the corneo-scleral junction uncovered, this seems the most likely place for the escape of fluid. Moreover, this part of the cornea is most subject to staphyloma, independent of wounds or ulcerations; and though this often occurs with adhesion to it and atrophy of the iris, yet it sometimes occurs where the iris is entirely or partially free, and the cornea therefore unlined at least in part by it, thus leading to the supposition that there may be increased pressure with consequent greater escape of fluid here than elsewhere.

Therefore marginal synechiæ will, without being able to cause glaucoma, yet tend to keep it up when once established by diminishing the escape of fluid; and though the way in which these adhesions act may be a matter of speculation, yet the results of their action are clear matters of fact. This peripheral adhesion can be frequently made out in glaucoma cases during life, and the anterior chamber is generally a trifle limited and shallower on that side, but very noticeably so if the case is an advanced one. I have several sections showing the condition only just being established, for the base of the iris is adherent to the ligamentum pectinatum iridis, but has not attained to the cornea.

In *every* specimen of Group A iritic adhesion is found, and in 26 out of the 29 cases this adhesion affects, though rarely is limited to, the periphery of the chamber.

In 22 out of the 25 cases of Group B peripheral iritic adhesions are found, and in the remaining three the iris is entirely free.

What I have to say about pathological changes in the *blood-supply* refers only to the condition of the canal of Schlemm and the veins in the ciliary muscle.

Schlemm's canal is commonly closed in my specimens of increased tension by apposition of its internal and external walls, but this is by no means universally the case, for this closure is a much less constant condition than either the atrophy of the ciliary muscle or the atrophy or adhesion

of the iris. In fact in some cases, notably the two specimens of buphthalmos, a very patent condition of Schlemm's canal is met with; and therefore I am disposed to attribute its closure to its compression, either through the dragging forward of the iris in a prolapse or its bulging forwards from pressure behind, as in the cases of Group B. And comparison of the cases in which the closure occurs supports rather this view. In these cases also the nuclei in the tissue surrounding it are increased somewhat, but this, like the closure, is so variable a symptom, that I do not attach much importance to either as causes of increased tension. I rather look on them both as results: the former of increased pressure, and the latter of contiguity of the inflamed base and anterior surface of the iris. Considerable importance has been attached by Dr. Max Knies in his very excellent paper to this condition, but I think wrongly.

In studying longitudinal sections of the atrophied ciliary muscles of glaucomatous eyes, it is very common to find sections of dilated empty venous channels. These are of more frequent occurrence than the changes in Schlemm's canal, but are not so constant as the ciliary and iritic changes above described. I am unable to say precisely what may be the pathological causes or results of this condition, but the atrophy of the muscle may be connected with yielding of the muscular tissue surrounding its veins. The increased intraocular pressure should have a tendency to close these veins. We may connect them with the dilated ciliary veins so often seen externally during life in such cases.

It is extremely likely that the ciliary muscle has functions besides that of accommodation, and that it may be concerned in regulating the blood supply. This might explain the effect of an atrophied ciliary muscle in passively keeping up an increased tension, notwithstanding that the periphery of the iris has never been united to the cornea.

Certainly the existence of fairly-developed muscles in eyes which have been for long cataractous, (in one of my cases for 15 years, and in one from which the opaque lens had been removed for 11 years), and in many very senile cases, seems to show that its functions extend beyond that of accommodating the eye for near vision.

But if the ciliary muscle have these functions, its paralysis should be accompanied by increased tension.

This, however, tends to be the case, for in glaucoma one of the earliest symptoms is the paralysis of accommodation; and primary glaucoma (Group B) is far most common in senile eyes, where the accommodation is feeble, and in hypermetropic senile eyes where the strain upon it is especially great. Moreover, I have seen several well-marked cases in which, with slight increase of tension, the use of atropine has caused a great exacerbation of the symptoms.

I have no personal experience of any value of the effect of atropine on the tension of healthy eyes, but that it does not cause any unmistakable increase of tension need not, considering the double course of the muscular fibres and possible double function of the muscle, much affect my argument.

For more particular information as to its effect on the tension of diseased eyes I must refer to the experience of others.

From the previous observations I draw the conclusion that, as increased tension is for long unaccompanied by any ophthalmoscopic change in the optic disc, and as moderate long-continued tension will not produce a cup with undermined edges, the term *glaucoma cup*, as applied to this form only, should be abolished.

If I may venture to derive from pathology a few suggestions for operative treatment, I shall draw attention to the fact that even where the peripheral marginal corneal adhesion of the iris exists only at one part of its circle, an iridectomy here, which must necessarily leave the peri-

phery of the iris unfreed from the cornea, will not relieve the tension; and therefore I should choose that part where the iris is unadherent.

The danger of leaving iritic adhesions after operations is very well known, but the way in which they act, by causing iritis and finally inflammation and atrophy of the ciliary muscle, with, I believe, consequent increased tension, is well illustrated in some of my specimens.

DESCRIPTION OF THE FIGURES.

Fig. 1.—Antero-posterior section in a horizontal plane of inner ciliary region of Alfred R., æt. 10, a patient of Mr. Couper. (No. 110.)

Keratitis from contact of lime 6 weeks before excision. Conjunctiva destroyed. Tension normal at excision, no evidence of increase at any time.

Muscular fibres well developed, both longitudinal and circular; thickness opposite origin of radial fibres = .71 mm.; most anterior part of muscle extends .34 mm. in front of the radial origin.

Iris quite free; thickness about = .25. Its nuclei and those of ciliary body are increased.

Corneal and scleral tissue infiltrated with nuclei. Epithelium wanting.



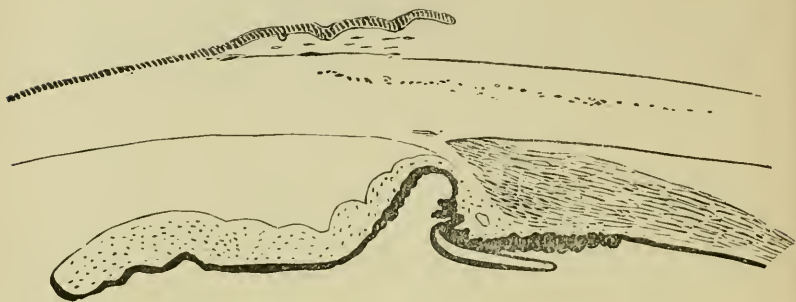
Fig. 1.

Fig. 2.—Antero-posterior section in horizontal plane of *inner* ciliary region of left eye of Lucina G., æt. 29, a patient of Mr. Hulke. (No. 121.)

There was a small sarcoma of the choroid at the *outer* side, extending

from 2 mm. in front of optic disc forwards, to within 5 mm. of ora serrata. She first noticed the eye dim 2 years ago. At excision tension = + 1.

Ciliary muscle has a maximum thickness of .42 mm.; muscular fibres obscurely seen; nuclei of ciliary body increased. Iris not atrophied, thickness about = .3; periphery just lines space of Fontana; its nuclei increased.



X.24

Fig. 2.

Fig. 3.—Optic disc of right eye of Harry M., æt. 7½ months, a patient of Mr. Lawson. (No. 52.) Eye excised for anterior staphyloma of cornea after perforating ulcer, in consequence of ophthalmia neonatorum.

Tension slightly increased. There is central depression of optic disc, and a pushing back of the lamina cribrosa.



X:30

Fig. 3.

Fig. 4.—Antero-posterior vertical section of superior ciliary region of right eye of Amelia D., æt. 50, a patient of Mr. Lawson. (No. 777.) No operation had ever been performed on this eye. Glaucoma absolutum

Fig 4.



X 24.

Fig 5.



following a blow six weeks ago ; for the last three weeks there has been great pain. *At excision* the tension is + 3.

Ten years ago she found accidentally that this eye had only perception of light. She came here and cataract was diagnosed, and an operation was advised. She, however, refused. Till the blow six weeks ago, she never had any trouble with it. Pupil dilated ; *lower* limb of iris shorter.

In this specimen the ciliary muscle exhibits very little muscular fibre remaining. Its greatest thickness is $\cdot 29$ mm. Iris thin but long ; average thickness of limb = $\cdot 12$ mm. ; its free end = $\cdot 21$ mm. ; its base is applied and adherent to the cornea at the periphery of the aqueous chamber. Nuclei of iris and those between the fibres of ciliary muscle are a little in excess.

Fig. 5.—Corresponding section from lower ciliary region of same eye. (No. 777.)

Ciliary muscle much larger ; greatest thickness = $\cdot 7$ mm. Its fibres better developed. Iris presents no adhesions ; thickness about $\cdot 3$ mm. Slight excess of nuclei in both iris and ciliary body.



Fig. 6.

Fig. 6.—Optic disc of right eye of John C., *æt.* 44, a patient of Mr. Hutchinson. (No. 35.)

Absolute glaucoma. Disease of $3\frac{1}{2}$ years' standing. Periphery of iris lines space of Fontana. Ciliary muscle much atrophied. The cup is seen to be very deep, and its edges are undermined. The fibres of the lamina cribrosa are bulged far back, and closely compressed.

REPORT ON TWO CASES OF RARE TUMOUR OF THE EYE.

By W. A. BRAILEY, M.D.,
Curator of the Museum.

EPITHELIOMA OF CONJUNCTIVA.

CASE 1.—*Epithelioma of Conjunctiva, involving Corneal Epithelium, of two years' duration in Right Eye of Man æt. 60—Repeatedly shaved off and cauterized at intervals of about six weeks—Return of growth and increase of pain—Excision of Globe.*

[Clinical notes by Dr. Gunn, House Surgeon to the Hospital.]

Joseph B., æt. 60, admitted under the care of Mr. Hulke on April 29, 1876. He is an active, well-nourished man, in good general health.

Eighteen months ago he first observed something unusual in the right eye. On the outer third of the corneal periphery and involving the adjacent conjunctiva is a patch consisting of a number of small red papillary elevations. It has caused slight uneasiness from the rough surface rubbing against the lid.

The epithelial growth was now shaved off with a scalpel, and the raw surface touched with solid nitrate of silver. A cold compress was applied, and gutt. atrop. and oleum ricini dropped occasionally into the eye. Discharged on May 6.

On June 14, the growth, having returned, was again shaved off, and he was discharged next day. On July 5 it seems to have been more or less subdivided into three elevated patches. These were now all shaved off and the surfaces cauterized. Some irritation followed. Discharged July 8. On November 18 there were two patches of papillary elevations, which were treated as above. This was followed by considerable pain and œdema of lids: the sloughs separated on the 2nd day. Discharged November 22. After this operation the ulceration following the slough showed no tendency to heal, and the growth seemed progressing more rapidly than before. There was now much pain, and on

December 30 the eye was excised. The left eye was quite unaffected throughout. Discharged January 3, 1877.

Sections through the growth near its thin edge show it to begin 4.5 mm. in front of the sclero-corneal junction as a thickening of the conjunctival epithelium, whose free surface rises at the anterior tumour border by a rapid slope till the epithelium has attained a thickness of .36 mm., being more than ten times that of the healthy part near.

Here the columnar cells of the deepest row look quite normal retaining their level and resting on Bowman's membrane. The rounded cells superficial to these are much crowded. They and the still superficial squamous cells are somewhat enlarged and increased in number, but there is no marked distinction from normal in the microscopical appearance of the individual cells. The superficial lamellæ of the proper corneal tissue contain an increased number of nuclei, but all the rest of the cornea is otherwise quite healthy looking. The entire thickness posterior to Bowman's membrane is .7 mm.

Nearer to the sclero-corneal junction the conjunctival epithelium presents the same increase of thickness, but its deep surface unlimited by any visible membrane of Bowman, projects in very short rounded papilliform cellular masses into the proper corneal tissue. Still posterior to this the thickening of the epithelium comes to an end, and the ocular conjunctiva of its usual appearance rises from the globe to be continuous with the palpebral layers. Sections through the centre of the growth show the measurement from one corneal surface to the other to be increased from 1.06 to 1.5 mm. The deepest part, with a thickness of .45 mm. is made of corneal lamellar tissue, having rather more nuclei than normal, and bearing Descemet's membrane and its epithelium.

The most superficial part is still made of conjunctival epithelium of thickness and appearance as before described, but the papilliform projections from it are much enlarged, and extend down as broad, short columns into the superficial part of the proper corneal tissue. This is .7 mm. thick. Its superficial $\frac{1}{3}$ th has so many nuclei, that corneal tissue can scarcely be traced; but its deeper $\frac{2}{3}$ ths is made of distinctly recognizable lamellæ, with moderately increased nuclei.

The cellular columns project down for a short distance, then they end by giving off several similar root-like branches. These

after a longer or shorter vertical course end by running horizontally between and separating the lamellæ, and finally terminate as gland-like rounded cell columns.

On section they are solid, and are frequently shrunk so as not to fill up the spaces in which they lie, and sometimes these are left quite empty.

The cells of the columns are just like spherical epithelial cells, only slightly larger. All the cells and nuclei in the specimen stain well.

In another section, where the tumour extends back beyond the cornea, the conjunctival epithelium, where it is only loosely connected with the globe, is affected in the same way, and its processes extend through the loose subconjunctival tissue to enter the superficial part of the sclerotic.

The tumour, then, is a multiplication of the conjunctival epithelial cells. The proper tissue of the cornea is only affected as to its structure by an increase of its nuclei, though the lamellæ are separated by cell processes ramifying between them. By this means the corneal thickness is of nearly twice its normal measurements.

CASE 2.—*Fibrous Tumour of the Optic Nerve.*

Sarah D., æt. 62, married; charwoman; attended the Gray's Inn Road Ophthalmic Hospital on August 22, 1876, under care of Mr. Abbott.

History, from Mr. Abbott's notes.—The patient noticed 2 years ago a protrusion of the left eye, which she attributed to a blow of a fist which she had received on the eye 6 months previously. There has been but little pain or discomfort then or since. For the last 12 months there has been no perception of light. Movements of globe limited in all directions. Some soft tumour mass can be felt behind the globe on the inner side. The optic disc is swollen, and its veins are large and tortuous.

On October 4th Mr. Abbott removed the globe, together with as much of the tumour mass as he could obtain. This seemed to be a thickening of the optic nerve to a diameter of about 20 mm., and this extended, though in a less degree, quite into the optic foramen. On cutting it through there was much bleeding. Next day the orbit was much swollen, as if from blood clots.

November 14. The swelling has gone down, but there is some supraorbital pain on the left side.

December 12. The pain still persists. The orbit is fuller than it was, possibly from a return of the growth. She is leaving London in order to live in the country.

The patient has several times since been enquired about by Mr. Abbott, but all clue to her whereabouts has unfortunately been lost.

Examination of the eye after excision.

The globe seems normal, except that the choroid is a little congested, and there is atrophy of the retinal nerve-fibre layer. The disc also is swollen. The optic nerve in its sheaths passes back from its entrance into the globe for a distance of about 4 mm. with a total diameter of about 4·5 mm.; it then enlarges very abruptly, and in a distance of about 12 mm. more it has swollen into a mass of about 20 mm. diameter. This is invested by a tough capsule ·33 mm. thick, which is continuous nearer the eye with the outer unaffected nerve-sheath. this having a thickness of ·16 mm. only.

Longitudinal sections show that though the intersheath tissue is thickened from a diameter of 1 mm. near the optic disc, to 2·5 mm. in the tumour, yet the greater part of the increase in size is within the inner sheath, and is due not to a multiplication of the nerve elements—for, indeed, these are totally atrophied—but to a great augmentation of the fibrous tissue normally surrounding and isolating the nerve bundles.

Near the optic disc this fibrous tissue is somewhat increased, though the total diameter of the nerve itself is somewhat less than normal. Here the nerve bundles near one part of the circumference are still visible, while at another part their spaces are occupied by yellowish, granular matter, and in the central nerve region they are in all the sections quite empty and of diminished size, though of normal shape.

The intersheath tissue is here thicker, and its fibres much more closely arranged than normal, and this extends right up to the globe in sections as a tapering column, being more pronounced on one side of the section than the other.

As this intersheath tissue passes on the tumour, so its fibres become swollen and contorted, and appear on transverse section like structureless globes, on the exterior of which are

seen numerous small nuclei. On the tumour itself this hyaline appearance is lost, and it has the appearance of a slightly spongy network of fibres, these being marked by faint parallel, longitudinal striations, and exhibiting nuclei. A condensation of this tissue forms a band representing the continuation of the inner nerve-sheath, and within this again a similar fibrous nucleated network, though more open, represents the increased fibrous tissue of the nerve. Sufficiently thin transverse sections show the spaces to be tubular, being evidently the channels of the nerve-bundles. Blood-vessels ramify along the bundles of the tumour and thick-walled blood-vessels are numerous just within the inner sheath both in the nerve and the tumour mass.

NOTES OF HOSPITAL IN-PATIENTS.

By R. MARCUS GUNN, M.A., M.B.,

House Surgeon, Moorfields.

It is proposed in the following report to give a short account of each case treated in the hospital wards. The important cases will be described more at length. The present report embraces only the cases of conjunctival and corneal disease which have been under treatment since the beginning of last November; but it is intended to report the other diseases and the operation cases in subsequent numbers.

Granular Lids.

All those under treatment (13) had more or less pannus: in the majority (8) the cornea was ulcerated. Of these 10 were males, at an average age of 30 years. The remaining 3, females, had an average age of 18.

Nitrate of silver was the local application used in 8 cases. The duration of their stay in hospital varied from two to seven weeks. In the remaining 5 cases peritomy was thought necessary.

CASE 1.—(Mr. Critchett.) G. L.,* pannus, and ulceration of corneæ in boy, æt. 9. Iridectomy inwards in each. A fortnight later peritomy done in left. Slight improvement. 3 weeks.

CASE 2.—(Mr. Critchett.) G. L. and extensive pannus in both eyes of boy, æt. 16. Left cornea ulcerated. Peritomy in both. A month later was slightly improved: seton in each temple. (Brushed with sol. arg. nitratis, gr. x ad ʒi every second day.) Very tedious case. 7 weeks.

CASE 3.—(Mr. Lawson.) G. L. and severe pannus in man, æt. 43. Left cornea very vascular. Peritomy in left. Much purulent

* Abbreviations, P. L. = perception of light; G. L. = granular lids.

discharge. (Lot. aluminis.) Cornea remained cloudy and soft. 3 weeks.

CASE 4.—(Mr. Critchett.) G. L., corneæ vascular and pitted in man, æt. 29. 5 years' duration. Eyes inflamed in spring and autumn. Peritomy in both, followed by improvement in vision. 2 weeks.

CASE 5.—(Mr. Critchett.) G. L., considerable pannus and partial trichiasis in both eyes of young woman, æt. 21. (Arg. nitrate in solution and as mitigated solid used to lids; gutt. cupr. sulphat., followed by gutt. zinci sulphat.) Peritomy on both eyes, and Burow's operation on both upper lids, with intervals between the operations. Much improvement. Six months later R. V. = $\frac{20}{70}$; L. V. = $\frac{20}{100}$. Reads Jaeger 1.

Five cases were under treatment for the entropion resulting from old granular lids. In two the ordinary operations for removal of lashes and excision of portions of skin and muscle were performed with good result; the remaining three were as follows:—

CASE 6.—(Mr. Critchett.) Entropion and pannus in Irish woman, æt. 40, worse in left eye. Old corneal ulceration. Left eye, excision of lashes of upper lid, followed by Burow's operation. Right eye, partial excision of lashes. Result good.

CASE 7.—(Mr. Bowman.) Entropion and corneal opacity in both eyes of man, æt. 54. Left eye, old perforating ulcer; anterior synechia. Burow's operation and canaliculi slit in both. Corelysis (Bowman's) and iri lectomy outwards in left eye. Result satisfactory.

CASE 8.—(Mr. Critchett.) Trichiasis and pannus in right eye of boy, æt. 14. Burow's operation. Good result.

Ulceration of Cornea.

The following cases were nearly all of a more than ordinarily severe type. Nos. 1 to 37 are examples of onyx or ulceration with much infiltration and hypopyon. Next follow (38—43) six cases where the ulceration had a sloughing character. Cases 44—54 are of various kinds, but all less severe than the foregoing. Those remaining (Nos. 55—69) had a phlyctenular origin.

In all, excepting six cases, the final result was satisfactory, *i.e.*, useful sight was regained. In one case (42) the eye was lost, and was excised on account of pain and sympathetic irritation.

The treatment varied necessarily according to the form of the disease, and also, to some extent, according to the experience of the surgeon under whose care the case happened to be. The yellow ointment (10 to 15 grains yellow oxide of mercury to the ounce) was found especially useful in the milder forms of ulceration, such as the majority of phlyctenular cases. The results of hot belladonna fomentation (60 grains to the pint), used every half-hour and for several minutes at a time, were particularly brilliant in cases of ulceration with hypopyon. In cases of recent onyx with hypopyon much benefit was derived from cutting through the infiltrated corneal tissue. The hypopyon was generally evacuated at the time, and seldom reappeared. In none of these cases was the corneal wound reopened, as in Saemisch's operation. Where there was much pain accompanied by increased tension, paracentesis gave temporary relief, but the most lasting benefit followed in such cases from iridectomy. Quinine internally, in doses of one or two grains thrice daily, seemed to have a most beneficial action in one or two cases of hypopyon, the pus disappearing more quickly during its administration, the other treatment remaining the same.

CASE 1.—(Mr. Hulke.) Right eye: Small onyx with hypopyon in man, *æt.* 64. Considerable pain. (Fot. bellad. frequently.) Rapid improvement. Disappearance of hypopyon on sixth day.

CASE 2.—(Mr. Streatfeild.) Right eye: Large central onyx in stout flabby girl, *æt.* 2. Much photophobia. Incision into onyx through superficial corneal layers. (Fot. bellad., atropine, and quinine.) Extension of onyx and paracentesis corneæ (above) four days later. At discharge, three weeks afterwards: Anterior synechiæ. Cornea comparatively clear, except small yellow projection in centre. No pain.

CASE 3.—(Mr. Couper.) Right eye: Central ulcer with surrounding infiltration of cornea in anæmic boy, æt. 8. Pain; slight photophobia. Corneal section through ulcer. (Fot. bellad., syr. ferr. iodid., quinine.) Rapid disappearance of infiltration and relief of pain. Ulcer healed slowly. Slight relapse 3 months afterwards.

CASE 4.—(Mr. Wordsworth.) Left eye: Small central corneal ulcer with hypopyon in boy, æt. 14. Photophobia. (Fot. bellad. and quinine.) Improvement slow, but steady; hypopyon disappeared on 19th day. He had phlyctenular ulcers on right cornea. These healed slowly under belladonna and yellow ointment.

CASE 5.—(Mr. Couper.) Right eye: Central corneal ulcer with surrounding infiltration and hypopyon in man, æt. 62. Ciliary injection; severe pain. (Fot. bellad., quinine, blister to right temple.) Pain persistent, causing sleeplessness. Tension increased. Corneal section through ulcer on 14th day; slight temporary relief. Iridectomy (inwards) ten days later, followed by rapid improvement. Cornea clearing. Less pain and ciliary injection, and disappearance of hypopyon.

CASE 6.—(Mr. Wordsworth.) Left eye: Ulcer of cornea with large hypopyon in delicate girl, æt. 4. Much photophobia and pain. (Fot. bellad., gutt. atrop., quinine, syr. ferr. iodid., and ol. morrh.) Progress slow. Ulcer perforated on 14th day, followed by rapid improvement and relief from pain. Restoration of the anterior chamber and no return of hypopyon.

CASE 7.—(Mr. Bowman.) Left eye: Nearly central onyx, superficially ulcerated with surrounding infiltration. Right eye: Deep perforating corneal ulcer. Pain. Photophobia. Florid complexioned girl, æt. 16. Amenorrhœa. (Fot. bellad., quinine, syr. ferr. iodid., pil. al. et ferri.) Progress slow. Perforation in right on 14th day, followed by more rapid improvement. Both much benefited by calomel insufflation ten days later. Ultimately good result.

CASE 8.—(Mr. Streatfeild.) Left eye: Corneal ulcer with infiltration, slight ciliary injection, and pain in girl, æt. 18. Amenorrhœa. (Fot. bellad., gutt. atrop., syr. ferr. iodid., ol. morrh., and pil. al. et ferri.) Feverishness and slight tonsillitis (?) from atropine (it had been used for ten days). Eye slightly improved. Went home on account of sore throat.

CASE 9.—(Mr. Hutchinson.) Left eye: Ulcer of cornea below, with infiltration, and slight hypopyon in girl, æt. 6. Photophobia. (Fot. bellad., syr. ferr. iodid., ol. morrh., liq. cinchon.) Hypopyon disappeared on second day. Ulcer healed slowly (5 weeks). A small phlyctenule appeared in right eye; soon cured by yellow ointment.

CASE 10.—(Mr. Streatfeild.) Left eye: Deep corneal ulcer with hypopyon in boy, æt. 7. Slight pain. (Fot. bellad., atropine, quinine.) Rapid disappearance of hypopyon and relief from pain.

CASE 11.—(Mr. Hulke.) Right eye: Onyx with thick hypopyon in pale thin man, æt. 40. No pain. (Fot. bellad., atropine, quinine, wine, and extra diet.) Paracentesis twice at interval of two days, followed by temporary improvement. Ultimate recovery slow.

CASE 12.—(Mr. Hutchinson.) Right eye: Large corneal ulcer with considerable thick hypopyon in man, æt. 61. Similarly affected two years ago. Slight pain. (Fot. bellad., atrop., quinine.) Steady improvement, with disappearance of hypopyon on 16th day.

CASE 13.—(Mr. Lawson.) Right eye: Three small corneal ulcers, with thick hypopyon, in delicate man, æt. 41. Slight pain. (Fot. bellad., atropine, quinine, and extra diet.) Corneal section through two of the ulcers on fourth day, with evacuation of pus. Hypopyon re-formed three days later. Sent to the country.

CASE 14.—(Mr. Couper.) Left eye: Onyx with hypopyon in boy, æt. 1 year 8 months. Began 8 months ago. Right eye: Phlyctenular ophthalmia. Eczema of face. Corneal section in left. (Fot. bellad., liq. arsenicalis.) Rapid improvement in left.

CASE 15.—(Mr. Hulke.) Right eye: Large central onyx with hypopyon of ten days' duration in man, æt. 39. Ciliary injection and chemosis. Slight pain. (Fot. bellad., atropine, quinine, empl. lytt. to temple.) Perforation of cornea ten days later, with relief of pain. Slow improvement, but only bare perception of light.

CASE 16.—(Mr. Couper.) Left eye: Onyx with hypopyon in girl, æt. 5. Corneal section. (Fot. bellad., quinine, empl. lytt.) Rapid improvement, with disappearance of hypopyon on fourth day.

CASE 17.—(Mr. Streatfeild.) Left eye: Corneal ulcer, with

hypopyon of one month's duration in man, æt. 61. "Similarly inflamed 11 years ago." (Fot. bellad., atrop.) Rapid improvement, with disappearance of hypopyon on sixth day.

CASE 18.—(Mr. Couper.) Right eye: Extensive onyx with hypopyon in girl, æt. 2. Corneal section through onyx. (Fot. bellad., atropine, quinine.) No return of hypopyon. Steady improvement.

CASE 19.—(Mr. Streatfeild.) Left eye: Large, nearly central onyx, with hypopyon, in woman, æt. 45. Aqueous muddy. Headache. (Fot. bellad., atropine, quinine.) On third day hypopyon rather greater. (Spirit lotion and quinine.) A week later condition unaltered. Paracentesis, followed by steady improvement.

CASE 20.—(Mr. Streatfeild.) Left eye: Extensive onyx (? with hypopyon) in woman, æt. 50. Corneal section almost across entire cornea. (Fot. bellad., atropine, quinine, extra diet.) Onyx disappeared on about seventh day. Anterior chamber re-formed a few days later. Dense leucoma remained with transparent line corresponding to incision.

CASE 21.—(Mr. Wordsworth.) Left eye: Onyx with infiltration in woman, æt. 33. Severe pain occasionally. (Fot. bellad., atropine, quinine.) Improved steadily.

CASE 22.—(Mr. Streatfeild.) Left eye: Ulcer of cornea with slight hypopyon and conjunctival injection in girl, æt. 10. Iridectomy upwards: escape of pus. (Fot. bellad., atropine, quinine.) On second day hypopyon re-formed; catarrhal ophthalmia in right. Next day thick hypopyon = $\frac{1}{3}$ in left. Two days later hypopyon nearly gone, but increased again after a similar interval. Corneal section now made. Pus escaped and was not re-formed. (Syr. ferr. iodid., ol. morrh.) Wound gaped; anterior chamber formed slowly.

CASE 23.—(Mr. Streatfeild.) Right eye: Corneal ulcers (two), with hypopyon, in girl, æt. 5. No pain. (Fot. bellad., atropine, quinine.) Rapid improvement.

CASE 24.—(Mr. Wordsworth.) Left eye: Central corneal ulcer with hypopyon in boy, æt. $3\frac{1}{2}$. Sclerotic injection. Occasionally severe pain. (Fot. bellad., atropine, quinine.) Rapid improvement, with disappearance of hypopyon.

CASE 25.—(Mr. Lawson.) Right eye: Central corneal ulcer with hypopyon in delicate woman, æt. 50. Eye has always been

"weak." Posterior synechiæ. Subject to rheumatism. (Fot. bellad., atropine, quinine.) Disappearance of hypopyon on third day. Cornea cleared rapidly.

CASE 26.—(Mr. Hutchinson.) Left eye: Nearly central ulcer with fluid hypopyon in man, æt. 34, result of abrasion seven days ago. Pain slight. (Fot. bellad.) Small iridectomy downwards three days later; part of pus adhered to iris. (Spirit lotion 1 to 3.) Hypopyon quite gone next day. Cornea cleared rapidly.

CASE 27.—(Mr. Soelberg Wells.) Large, deep, crescentic ulcer over middle of left cornea with thick hypopyon in healthy-looking girl, æt. 17. Fleishy corneal vascularity above: lids granular. (Fot. bellad., atropine, lids occasionally brushed with sol. arg. nitrat. gr. x ad ʒi.) Corneal vascularity increased for first fortnight, spreading round the cornea. Afterwards slow improvement, cornea becoming clear.

CASE 28.—(Mr. Streatfeild.) Small, deep, transparent, central ulcer of left cornea, with slow iritis and slight hypopyon in robust looking woman, æt. 23. Much ciliary and conjunctival injection. History of recent detached retina? Amenorrhœa. (Fot. bellad., atropine, pil. al. et. ferri, 8 mustard pediluvia.) Anterior chamber leaked and was again restored several times during first three weeks. After about 14 days menses appeared. Two fine long posterior synechiæ detached by ivory hook. Eye slowly improved.

CASE 29.—(Mr. Hutchinson.) Central corneal ulcer with surrounding infiltration and hypopyon of 7 days' duration in left eye of girl, æt. 7. Ciliary injection. Corneal nebula in right eye. (Fot. bellad., empl. lytt. to left temple, syr. ferr. iodid., ol. morrh., quinine.) On third day fot. bellad. replaced by spirit lotion (on lint, re-wetted every hour). Next day all hypopyon gone. (Seton in left temple.) Ulcer healed rapidly. Cornea rather steamy.

CASE 30.—(Mr. Hutchinson.) Ulceration of right cornea with surrounding infiltration and hypopyon in girl, æt. 4. Iridectomy downwards. (Fot. bellad., cinchona.) Improvement slow at first: much hastened by seton in temple.

CASE 31.—(Mr. Bowman.) Central ulcer with hypopyon and slight ciliary injection in left eye of boy, æt. 2. (Fot. bellad., quinine.) Rapid improvement.

CASE 32.—(Mr. Streatfeild.) Ulceration of both corneæ in delicate boy, æt. 3½. Right eye, small ulcer. Left eye, large

central onyx with hypopyon. Iridectomy upwards and onyx slit superficially. (Fot. bellad., atropine, vin. ferri; ol. morrh.) Right eye: rapid improvement. Left eye: increase of onyx: complete corneal section, followed 3 days later by paracentesis below, with partial escape of hypopyon. (Cold douche occasionally.) Slow improvement.

CASE 33.—(Mr. Couper.) Small central onyx with slight hypopyon, of 5 weeks' duration in left eye of stout flabby boy, æt. 2. Lids somewhat swollen. Corneal section: no return of hypopyon. (Fot. bellad., atropine, quinine.) Rapid improvement.

CASE 34.—(Mr. Lawson.) Central corneal ulcer with thick hypopyon in right eye of healthy-looking man, æt. 38. Exposed to dust and chaff. (Fot. bellad., atropine, quinine.) Steady improvement: hypopyon gone on 14th day.

CASE 35.—(Mr. Hutchinson.) Corneal ulcers with infiltration and hypopyon (one-half) of 14 days' duration in left eye of girl, æt. 2, with pertussis. Sclerotic injection. Was inflamed 12 months ago. Phlyctenule in right eye. (Fot. bellad., cinchona; ol. morrh.) Hypopyon all gone on 3rd day: no return. Ulcers healed rapidly.

CASE 36.—(Mr. Couper.) Superficial ulceration of entire right cornea, with thick hypopyon (one-half) of 3 weeks' duration in man, æt. 52. Has had insufficient food and clothing. Pain slight. Tension increased. (Fot. bellad., quinine, extra diet and beer.) No improvement. On 10th day paracentesis below: pus evacuated, and small piece of iris excised. Four days afterwards new epithelium began to form. No return of hypopyon except small fragment of puro-lymph at seat of iridectomy. No pain. Bare p l.

CASE 37.—(Mr. Hutchinson.) Small central onyx with infiltrated margin in right eye of stout intemperate (?) man, æt. 42. Pain. Recent iritis. Iridectomy downwards. (Fot. bellad., atropine, quinine, extra diet with stimulants.) On 4th day fot. bellad. replaced by spirit lotion, followed by relief of pain. Return of acute symptoms after exposure to cold: corneal section through onyx without visible escape of purulent matter. Occasional return of severe pain. (Seton in right temple.) Slow improvement. Sent to sea-side.

CASE 38.—(Mr. Streatfeild.) Right eye: sloughing ulcer of cornea in woman, æt. 29. Slight chemosis and ciliary injection.

Is suckling an infant 6 months old. (Fot. bellad., atropine, iron and quinine, beer.) Perforated on 8th day: hypopyon. Aqueous restored, and ulcer healed slowly.

CASE 39.—(Mr. Wordsworth.) Left eye: extensive sloughing ulcer at lower part of cornea in lad, æt. 19. Duration 18 days: history of foreign body in eye. Aqueous muddy. Slight pain. (Fot. bellad., atropine, quinine.) Seven days later entire cornea involved, followed by irritability in right eye. Ultimately condition improved: large dense leucoma.

CASE 40.—(Mr. Soelberg Wells.) Left eye: recent perforation of cornea below (from ulceration) with prolapse of iris in woman, æt. 36. Small indolent ulcer in right cornea above. Extensive lupus of face. (Fot. bellad., atropine, ferri et quin. citr.) Prolapse punctured and small iridectomy, followed by improvement. Progress tedious, and not quite satisfactory.

CASE 41.—(Mr. Wordsworth.) Left eye: nearly central prolapse of iris from recent perforating ulcer in flabby boy, æt. 8. Small marginal phlyctenule. (Fot. bellad., compress bandage, quinine, syr. ferr. iodid.; ol. morrh.) Fifteen days later lower part of right cornea infiltrated with pus: formation of slough, and perforation on 4th day. (Treatment as for left.) Prolapse in left slowly flattened, and anterior chamber re-formed in both.

CASE 42.—(Mr. Hutchinson.) Right eye: large, deep, perforating ulcer of cornea (below) with much infiltration, in delicate boy, æt. 5. Conjunctiva congested: lids swollen and eczematous. Impetigo of forehead and right cheek: glands in neck enlarged. Pain slight. (Ung. hydr. ox. flav. dil., seton in right temple, quinine.) On 4th day no improvement. (Spirit lotion (1 to 2), syr. ferr. iodid., and ol. morrh. added.) Two days later ulcer perforated: large prolapse of iris. Left eye now irritable, with marginal phlyctenules. (Ung. hydr. ox. flav. for left eye: discontinued in right eye.) Soon afterwards right eye became painful, and was excised: slight cellulitis followed. Left eye recovered rapidly.

CASE 43.—(Mr. Streatfeild.) Right eye: interstitial supuration of lower two-thirds of cornea of 4 days' duration. Left eye: large deep central sloughing ulcer; cornea nearly perforated; of 7 days' duration. Both painful. Woman, æt. 31. (Fot. bellad., atropine, quinine.) Central slough formed in right on 2nd day. Separation of sloughs in both eyes after a week.

Temporary relief of pain from paracentesis: repeated. Healing slow, but satisfactory.

CASE 44.—(Mr. Streatfeild.) Right eye: nearly central corneal ulcer with surrounding infiltration in feeble man, æt. 70. No pain. Retention of urine (from enlarged prostate). (Fot. bellad., atropine, quinine, extra diet.) Under treatment 5 days. Slight improvement.

CASE 45.—(Mr. Couper.) Left eye: ulceration of old leucoma and of surrounding cornea, with infiltration, in woman, æt. 29. Much ciliary injection and pain. Is suckling infant 8 mos. old. (Fot. bellad., atropine, quinine, extra diet.) Slight improvement. On 7th day corneal section, followed by relief from pain. Cornea cleared rapidly.

CASE 46.—(Mr. Streatfeild.) Left eye: vascular ulcer near lower margin of cornea in boy, æt. 14. Cornea dull, and pitted all over; $2\frac{1}{2}$ months' duration. No pain now. (Fot. bellad., gutt. atrop. et zinci sulphat., syr. ferr. iodid., ol. morrh.) Slow improvement.

CASE 47.—(Mr. Streatfeild.) Left eye: small corneal ulcer below, with surrounding infiltration, in woman, æt. 56. Right eye ulcerated 12 months ago. Considerable pain. (Fot. bellad., atropine, iron and quinine.) Rapid improvement.

CASE 48.—(Mr. Streatfeild.) Left eye: central corneal ulcer, with slight infiltration, in girl, æt. 12. Crescent of minute straight vessels at lower corneal margin, swelling of lids, ciliary injection, and pain. (Fot. bellad., atropine, quinine.) Improvement quick and steady.

CASE 49.—(Mr. Wordsworth.) Right eye: large, dense leucoma with marginal vascularity. Left eye: small ulcer with much corneal infiltration. Girl, æt. 7. Palpebral papillæ elevated. (Fot. bellad., ung. hydr. ox. flav. dil., syr. ferr. iodid., ol. morrh.) Slow but steady improvement.

CASE 50.—(Mr. Wordsworth.) Ulceration of both corneæ in child, æt. 18 months. Fot. bellad.) Rapid improvement.

CASE 51.—(Mr. Streatfeild.) Left eye: corneal ulcer with surrounding infiltration in man, æt. 47. (Fot. bellad.) Rapid improvement.

CASE 52.—(Mr. Hutchinson.) Left eye: ulceration, with much corneal infiltration, of 3 weeks' duration, in girl, æt. 11. History of alternating ulceration of both corneæ. (Seton in left

temple, empl. lytt. behind ear, spirit lotion, quinine.) Rapid improvement.

CASE 53.—(Mr. Hutchinson.) Left eye: small ulcer with patches of vascularity in cornea of man, *æt.* 23; 18 months' duration. Enlarged papillæ on lids. (Ung. hydr. ox. flav. dil., arg. nitrat. gr. x ad ζ i used once, quinine.) Benefit from seton in temple. Improvement slow.

CASE 54.—(Mr. Wordsworth.) Left eye: deep, transparent, marginal, creeping ulcer, of 2 months' duration, at outer third of cornea in feeble woman, *æt.* 51; 18 mos. past climacteric period. Postr. synæ. (Fot. bellad. c. alumine; atropine, ferri et quin. citrat., extra diet.) Slow steady healing, beginning at the extremities, hastened by local application of arg. nitrat. gr. x (or more) ad ζ i every second morning.

CASE 55.—(Mr. Critchett.) Phlyctenular ulceration of both corneæ in strumous boy, *æt.* 13. Much vascularity and photophobia. Lids thick with papillary elevations. (Fot. bellad., quinine, syr. ferr. iodid., ol. morrh., extra milk.) Very slow progress at first. Setons then inserted into both temples and solid nitrate of silver applied to outside of lids, followed by more rapid improvement.

CASE 56.—(Mr. Hulke.) Right eye: small corneal phlyctenule in boy, *æt.* 14. Has had several previous attacks. (Ung. hydr. ox. flav. dil., vin. ferri, ol. morrh.) Rapid improvement.

CASE 57.—(Mr. Wordsworth.) Phlyctenular keratitis in both eyes of girl, *æt.* 8. Much photophobia. (Fot. bellad., atropine, syr. ferri iodid., ol. morrh.) Improved slowly.

CASE 58.—(Mr. Couper.) Phlyctenular ulceration of both corneæ, worse in left, in man, *æt.* 23. Frequent attacks. Began after measles 6 years ago. Rather anæmic. Has acne every spring. (Ung. hydr. ox. flav. dil. to right eye; fot. bellad. to left, cinchona.) Rapid improvement.

CASE 59.—(Mr. Wordsworth.) Right eye: marginal phlyctenular keratitis. Left eye: phlyctenular ulcer of cornea in girl, *æt.* 10. Much photophobia in both. (Fot. bellad., atropine to both; ung. hydr. ox. flav. dil. to right eye; quinine, syr. ferr. iodid., ol. morrh.) Rapid improvement.

CASE 60.—(Mr. Bowman.) Small vascular phlyctenular ulcers on both corneæ of delicate girl, *æt.* 13. Much photophobia. Similar attacks repeatedly from infancy. Pityriasis of scalp.

(Fot. bellad., atropine, calomel insufflation, syr. ferr. iodid., ol. morrh.) Steady improvement, but recovery rather tedious.

CASE 61.—(Mr. Hulke.) Phlyctenular ulceration of both corneae in stout florid lad, æt. 19. Much pain and photophobia. (Fot. bellad., atropine, syr. ferr. iodid., ol. morrh., empl. lytt. frequently to temples.) Slow improvement with occasional relapses. Sent to the country.

CASE 62.—(Mr. Wordsworth.) Phlyctenular ulceration of left cornea, with much vascularity and photophobia in dark complexioned, strumous girl, æt. 11. (Fot. bellad., atropine, vin. ferri, ol. morrh., quinine.) Tedious recovery.

A phlyctenule appeared on right eye, but yielded in a day or two to ung. hydr. ox. flav. dil.

CASE 63.—(Mr. Wordsworth.) Left eye; marginal phlyctenules in boy, æt. 10. No pain. Slight photophobia. (Ung. hydr. ox. flav. dil.) Improved rapidly.

CASE 64.—(Mr. Wordsworth.) Right eye: phlyctenular keratitis of 14 days' duration in florid strumous lad, æt. 20. Much vascularity. No pain. Deep anterior chamber. Left eye: similar condition of 3 days' duration. Slight pain. Much photophobia in both. Is subject to such attacks. (Fot. bellad., atropine, quinine.) Improved steadily.

Re-admitted 10 days after discharge with return of above condition: improved under similar treatment; sent to seaside.

CASE 65.—(Mr. Lawson.) Left eye: phlyctenular ulceration of cornea in girl, æt. 19. (Fot. bellad., syr. ferr. iodid.) Steady improvement.

CASE 66.—(Mr. Bowman.) Right eye: phlyctenular ulceration of cornea with infiltration and vascularity. Left eye: phlyctenular ophthalmia. Man, æt. 37. No pain. Has had two previous attacks in right (6 years ago and 9 months ago). Impetiginous eruption on chin and neck. (Fot. bellad., quinine, iron.) Steady improvement, hastened latterly by calomel insufflation.

CASE 67.—(Mr. Critchett.) Left eye: phlyctenular ulceration of cornea in woman, æt. 24. Eye has been frequently inflamed since age of 2 years. Right eye affected first 2 years ago. Myopia $\frac{1}{6}$. (Fot. bellad., atropine, quinine, iron, seton behind left ear.) Rapid improvement.

CASE 68.—(Mr. Wordsworth.) Phlyctenular keratitis in both

eyes of boy, æt. 9. Great photophobia. (Fot. bellad., atropine, ung. hydr. ox. flav. dil., syr. ferr. iodid., ol. morrh.) Improved steadily.

CASE 69.—(Mr. Couper.) Phlyctenular keratitis of both eyes with blepharitis marginalis in girl, æt. 19. Much photophobia. Eyes have been always weak. (Fot. bellad., ung. hydr. ox. flav. dil., liq. arsenic.) Steady improvement, seemingly hastened at last by empl. lytt. to temple.

PART II.

A Periscope

OF

CONTEMPORARY OPHTHALMIC LITERATURE.

BUPHTHALMOS.

PROF. HIRSCHBERG (Graefe's Archiv., Bd. xxii, Abth. iii, p. 139) remarks that under the term congenital buphthalmos two different conditions are included. The one form is that of cornea globosa, in which, with increasing deepening of the anterior chamber, luxation of the lens, and excavation of the optic nerve, blindness ensues quite gradually, but even in childhood. In other cases of congenital and increasing enlargement of the eyeball, the condition is due to foetal iritis (irido-choroiditis); from the first we find, without any evidence of perforation of the cornea, circular synechia and bulging of the iris associated with blindness of the affected eye. Of the latter form he narrates an early stage. The patient was a child six months old, whose mother had one normal eye, and the other highly myopic, with sclero-choroiditis and slight amblyopia. Fourteen days after birth the child's left eye was noticed to diverge, and subsequently to enlarge gradually. When seen, the left eye was markedly larger than the other, the sclerotic was white, the cornea clear, the iris bossy, the pupil small and closed with a white membrane, the tension was markedly increased, the eyelids irritated by the enlarged eyeball. After removal, the eyeball was hardened, divided horizontally, and then sections were made with the microtome. Evidences of severe iritis such as occurs after birth were found. The anterior chamber was diminished in all directions, its section had the form of a battle-axe, the broad part directed forwards to the cornea. The pupil was closed with a firm coherent membrane, intimately united with the anterior capsule of the lens. The iris was pushed forward leaving a space filled with fluid between it and the lens, apparently a real serous cyst, caused by splitting of the uveal layer of the iris into two laminæ; a representation is given. The retina and choroid seemed but slightly altered, the disc showed a deep cup, with a narrow entrance. Stress is laid on the peculiarity

of the exudation being between the two laminae of the uveal layer of the iris.

CONGENITAL MICROPHTHALMOS.

Prof. Hirschberg (l.c.) describes a specimen which he thinks is an instance of microphthalmos, due to disease of the eye all during foetal life. The patient was a girl aged 14, whose right eye was said to have been blind and abnormal from birth, without any inflammation or suppuration having been noticed at any time. There was nystagmus of both eyes, and convergence of the right. The left eye was hypermetropic, but otherwise normal. The horizontal diameter of the right cornea was 7 mm. (.28 in.), that of the left $11\frac{1}{2}$ mm. (.46 in.). The cornea was transparent, except a band in the horizontal meridian. The pupil was comparatively wide, and did not react to light. A yellowish reflex came from behind it. By focal illumination a yellowish convex bladder could be seen behind the iris, ending in a pedicle posteriorly. Pressure in the ciliary region gave rise to pain. The eyeball was removed. The posterior half seemed much larger than would have been expected from the size of the cornea. The length of the eyeball was $17\frac{1}{2}$ mm. (.7 in.), the breadth of the cornea 7 mm. (.28 in.), the height $6\frac{1}{2}$ mm. (.26 in.). The state of parts within the eye resembled a funnel-shaped detachment of the retina. Representations are given of the two halves of the section of the eyeball. There were evidences of inflammation of the choroid, but there was no coloboma. In the anterior part of the space behind the iris was a funnel-shaped mass containing the lens, vitreous, and retina. The anterior extremity of the funnel was 2 or 3 mm. (.08—.12 in.) behind the plane of the iris; the posterior extremity passed to the disc. The lens was very small—3 mm. (.12 in.) in thickness, and 4 mm. (.16 in.) in breadth—and was displaced upwards and outwards. The capsule was nearly empty. There was a process passing from the posterior part of the mass to the fundus, and probably represented the remains of a vessel.

OPERATIONS ON THE VITREOUS.

Prof. Hirschberg (l.c.) narrates two cases, in which he removed foreign bodies from the vitreous. He had to enucleate subsequently, and gives details of the conditions found (with illustrations).

ANOPHTHALMOS, WITH CONGENITAL CYSTS OF THE LOWER EYELIDS SIMULATING ECTOPIA OF THE EYES.

A child came under Dr. Wecker's care with absence of the eyes and cystic tumours of the lower eyelids. A quantity of fetid sebaceous matter was evacuated from the orbits. It was doubtful whether the tumours communicated with the cranial

cavity, or represented the eyeballs. They were tapped, and some fluid evacuated resembling that of the aqueous chamber rather than cerebro-spinal fluid. The results of chemical analyses are given. (*Annales d'Oculistique*, Mars—Avril, 1877, p. 151, and *Relevé Statistique*.)

CONGENITAL ABSENCE OF IRIS WITH EXCAVATION OF THE OPTIC NERVE.

Dr. Samuelson, of Manchester, sends a note of case recorded by him in *Brit. Med. Journal*, Nov. 7, 1863. (*Zehend. Klin. Monatsbl.*, xv, Mai, p. 189.)

A CASE OF MALFORMATION, IRIDEREMIA, &c.

Dr. S. Klein gives a detailed description of a case in which there was irideremia, displaced lenses, absence of the zonule of Zinn, excavation of optic disc, &c. He also quotes recorded cases of irideremia, &c. The paper is too long for sufficient abstract. (*Zehend. Klin. Monatsbl.*, xv, Jan., pp. 21, 47.)

IRIDEREMIA IN ONE EYE IN HYDROPHTHALMUS CONGENITUS.

Dr. Brunhuber gives a detailed account of a case in *Zehend. Klin. Monatsbl.*, xv, Marz., pp. 104—116.

DERMOID OF THE CARUNCLE.

Schiess-Gemuseus records and figures a case (*Zehend. Klin. Monatsbl.*, xv, April, p. 135).

MICROPHTHALMOS, WITH CONGENITAL SEROUS CYSTS BENEATH THE LOWER LIDS.

Dr. Talko records the case. (*Zehend. Klin. Monatsbl.*, xv, April, p. 137.)

ANOPHTHALMOS, WITH CONGENITAL CYSTIC FORMATION IN THE LOWER LIDS (WITH AN ILLUSTRATION).

Dr. Wecker. (*Zehend. Klin. Monatsbl.*, xiv, p. 329.)

ANOPHTHALMOS CONGENITUS.

Dr. Landesberg records four cases in *Zehend. Klin. Monatsbl.*, xv, April, p. 141.

HERPES IRIS CONJUNCTIVÆ.

Dr. Ernest Fuchs records a case under the care of Prof. Arlt. There was a membranous pelicle formed on the conjunctiva of the lids of both eyes. There was very little swelling. The mucous

membrane of the mouth and palate was also covered with patches of membrane. In the palm of the left hand were groups of spots resembling the eruption of herpes iris. The patient, a man aged 57, recovered perfectly. The results of a microscopic examination of the membranous productions is given. (Zehend. Klin. Monatsbl., xiv, pp. 333—351.)

FRAGMENT OF PERCUSSION CAP IN THE INTERIOR OF AN EYE FOR
24 YEARS—THEN IRIDO CYCLITIS—SYMPATHETIC IRRITATION
OF THE HEALTHY EYE—ENUCLEATION—RECOVERY OF THE
THREATENED EYE.

Dr. Meyhoefer records the case in Zehend. Klin. Monatsbl., xv, Feb., p. 75.

NEW METHOD OF PERFORMING PLASTIC OPERATIONS.

J. R. Wolfe, in *Med. Times and Gazette*, June 3, 1876. The operation consists in transplanting a large graft of skin from a distance. No subcutaneous connective tissue is allowed to remain, but carefully snipped off before being applied. Wadsworth records a case. (Report of Fifth International Ophthalmological Congress, p. 237. Also note in Zehend. Klin. Monatsbl., xv, Mai, p. 192).

TRANSPLANTATION OF THE CONJUNCTIVA OF THE RABBIT IN
SYMBLEPHARON BY J. R. WOLFE.

Two cases are recorded in the *Lancet*, April 8th, 1876.

SEROUS SUBCONJUNCTIVAL CYST OF THE LOWER LID IN A
WOMAN OF 21.

Prof. Dr. Laqueur records the case. (Zehend. Klin. Monatsbl., xv, Juni, p. 226.)

NEURO-PARALYTIC ULCERATION OF THE CORNEA.

Prof. Dr. Laqueur records a case. (Zehend. Klin. Monatsbl., Juni, xv, p. 228.)

ON CERTAIN IRREGULAR PARENCHYMATOUS AFFECTIONS OF THE
CORNEA, CAUSING STREAKY AND BAND-LIKE OPACITIES.

E. Raehlmann writes a paper on this subject, accompanied by illustrations. The opacities can only be detected by oblique illumination, and using a second lens to magnify. In some cases the opacities are quite superficial, in others deeper. The streaks cross one another at various angles, forming a network, and at various levels. Where they cross there are dots of opacity to be seen. The rest of the cornea may be clear, or the whole may be hazy. There is generally conjunctivitis, and often iritis. The progress is slow, except where the affection is syphilitic. The

author thinks the opacities are due to an affection of the lymph passages between the lamellæ of the cornea. If injections are made into the cornea, the fluid injected can be seen with the naked eye to diverge from the point of injection in straight or curved lines, with distinct nodes or points here and there. The lines are nothing but interfibrillar spaces, and indicate that the substance of the cornea can be split up more readily in certain directions, and exudation and infiltration materials from the sclerotic and conjunctiva can also pass more readily in the same way. He thinks that the corneal affection he describes is secondary to inflammation of the sclerotic, or episcleral tissue, or conjunctiva. Though slow in its course, the disease generally passes away without leaving serious mischief behind. Though iritis is common, adhesions are infrequent. The subjective symptoms are slight. Changes in tension are common. The compressive bandage is ill-borne, whilst warm moist applications are serviceable. During exacerbation atropine is strongly indicated. (Zehend. Klin. Monatsbl., xv, Jan., p. 1.)

STRYCHNINE IN OCULAR THERAPEUTICS.

An abstract of a memoir by G. Haltenhoff is given in the *Annales d'Oculistique*, Sept.-Oct., 1876, pp. 185-197.

DIABETIC CATARACT—SUGAR IN THE LENS.

Dr. Teillais. (*Annales d'Oculistique*, Nov.-Dec., 1876, p. 238.)

ON THE ANTISEPTIC PROPERTIES OF SOLUTIONS OF ESERINE AND ATROPINE.

Herm. Schmidt-Rimpler has been making the experiment of inoculating the cornea of rabbits with the secretion from an inflamed lachrymal sac. He found that when any of this secretion was allowed to remain for 20 or 50 minutes in a solution of carbolic or salicylic acids or chlorine-water, &c., it was deprived of septic properties. On making similar experiments with eserine and atropine he found the intensity of the action diminished but not rendered aseptic. The two solutions seemed to act in much the same way. (Zehend. Klin. Monatsbl., xv, April, p. 127.)

HYOSCYAMINE.

E. Pflüger contributes a paper to the *Archives of Ophthalm. and Otol.*, vol. v, Nos. 3 and 4, p. 333. He discusses the different preparations used, and gives the formula adopted in his own experiments. He sums up to the effect that pure hyoscyamine prepared by Dr. Stierlin, after Dammer's recipe, has an action similar to that of atropine; but it dilates the pupil more rapidly and for a greater length of time than atropine does. After many

and varied observations, he says he can fully endorse the statement of Prof. Dor, that in the lingering forms of interstitial parenchymatous inflammation of the cornea, hyoscyamine is productive of far better results than atropine. The solution used contained 1 part of pure hyoscyamine (Stierlin) in 150.

MENINGITIS AFTER REMOVAL OF GLOBE FOR WOUND—RECOVERY.

Dr. H. Meyhoefer records the case of a man *æt.* 24, whose right eye he removed 48 hours after an injury. A foreign body was found. In the afternoon of the following day he became restless, his temperature rose (38.5 C., 101.4 F.), and his pulse was hard and full. He had severe pain in his head. He was ordered ice to the head, quinine and calomel. On the third day he was worse; temp. 40.2 C. (104.3 F.). He was quite unconscious. Subsequently he had convulsions. On the sixth day he began to improve. His hearing was defective when sent out at the end of a month. Cases on record of death after enucleation are quoted. (Zehend. Klin. Monatsbl., xv, Feb. 1871.)

SYMPATHETIC OPHTHALMIA.

Dr. J. Hirschberg contributes a historical note to vindicate v. Ammori's claim to priority (1835) in noticing sympathetic affection of a normal eye after traumatic iritis, &c., of the other. (Archives of Ophthal. and Otol., vol. v, Nos. 3 and 4, p. 393.)

SYMPATHETIC OPHTHALMIA.

Dr. Savary records the case of a man *æt.* 33, who had had his right eye struck three years previously a violent blow, without, however, any external wound resulting. The eye for long remained quiescent and the vision was good, but finally the eye became painful and the sight failed. Excision of the injured eye was advised. He declined till the other became affected at the end of three years from the time of the blow. The injured eye was then soft and shrunken. After removal a bony growth was found in it. The patient had scarcely sight enough to see to go about with a stick. (Annales D'Oculistique, Sept.-Oct., 1876, p. 151.)

SYMPATHETIC OPHTHALMIA.

Dr. Adolph Alt contributes a paper on the Anatomical Causes and the Nature of Sympathetic Ophthalmia (Archives of Ophthalmol. and Otol., vol. v, Nos. 3 and 4, pp. 395—478). He gives detailed accounts of 32 eyes examined by himself, and quotes 78 others on record; the statistics, therefore, being based on 110 eyes. Tables are given summarising the conditions found in eyes enucleated for sympathetic irritation; for sympathetic iritis; irido-cyclitis; irido-choroiditis; affection of the retina; and,

lastly, affection of the cornea. Other tables show the numbers in each of these classes in which particular injuries had occurred or pathological conditions supervened. In addition, the results obtained from these statistics are dwelt on at length. In conclusion, he states that the cause necessitating enucleation in $83\frac{1}{2}$ per cent. of the cases was an injury, leaving $16\frac{1}{2}$ per cent. of the cases attributable to idiopathic inflammation. In 39 per cent. of the 110 eyes, we encounter injuries to the hard membranes with incarceration of a part of the uveal tract, *i.e.*, in $62\frac{3}{4}$ per cent. of all the injuries. The percentage of eyes setting up sympathetic troubles without presenting cicatrices in the hard membranes is very small (about 5 per cent.). In $44\frac{1}{2}$ per cent. of the cases of injury to the hard membranes, no part of the uveal tract was attached to the wound. These cicatrices are always combined with internal changes. Cicatrices and foreign bodies in the ciliary body or incarceration of it—which are usually looked upon as the most important factor in sympathetic affections—appear in only $17\frac{1}{4}$ per cent., while the affections of the ciliary body altogether amount to $76\frac{1}{2}$ per cent. The iris is changed in only 68 per cent. and the choroid in 73 per cent., thus showing almost the same number of changes in each of the parts of the uveal tract, with only a slight percentage in favour of the ciliary body. The percentage of changes in the retina and the optic nerve is remarkably great—79 per cent.; of the retina alone 73 per cent., and in 58 per cent. of these the retina is detached. Notwithstanding the fact that there is but one case described in which there was any affection of the retina without coincident affection of the uveal tract, it appears to him that the great percentage of affections of the retina and optic nerve should engage very earnest consideration—the more so as there are but $16\frac{2}{3}$ per cent. which present changes in the ciliary nerves. The author is inclined to attribute a greater share to the optic nerve in the transmission of the affection from one eye to the other, than is usually done. The sympathetic system must not be left out of view. In more than 99 per cent. of the cases, we have to deal with changes in the vascular membrane of the eye—consequently with disturbance of the entire circulatory system. It is worth mentioning that in 13 of the cases where eyes were enucleated for sympathetic iridochoroiditis, the other had been lost by panophthalmitis purulenta, and that of the five enucleated for neuroretinitis sympathetica three showed retinal detachment. The following practical deductions conclude the paper:—1. The entire nervous apparatus of the diseased eye participates in the transmission of the affection to the other. 2. Scars in the hard membranes, whenever combined with alterations in the other parts of the eye, particularly in the uveal tract, retina, or optic nerve, are capable of calling forth sympathetic affections of the other eye at any time. 3. Purulent panophthalmitis makes no exception. 4. Consequently its artificial production, as a prophylactic measure against

sympathetic affection, is reprehensible. 5. The time at which sympathetic affections most frequently manifest themselves varies between seven days and eight weeks after the beginning of the disease of the first eye. There does not appear to be any case noted in which structural changes occurred within a month. In the earlier cases, enucleation was performed for sympathetic "irritation." 6. As soon as the first trace of a sympathetic affection manifests itself (a diagnosis which should be made with the greatest care) therapeutic measures should be resorted to. 7. The only efficient means consists in enucleation of the eye first affected. 8. When it is fairly presumable that the affection has extended to the optic nerve, the removal of a large piece of the nerve, together with the globe, should not be omitted. 9. Should a case come under care in which the iris or capsule of the lens is incarcerated, the incarcerated iris or capsule should be freed before sympathetic irritation has made its appearance. In recent cases, an abscission of the prolapse, with or without iridectomy, will obviate in most cases the impending danger of sympathetic ophthalmia.

VASOMOTORY AND SECRETORY NEUROSES OF THE EYE.

Dr. Schliephake contributes some observations (from Professor Nagel's clinique) on various affections of the eye associated with diminution of tension, and dependent, he thinks, on some nervous disturbance of vascular supply or intraocular secretion. These cases have not received so much attention as they deserve, or as those attended by increase of tension. Bowman has referred to such in the course of glaucoma, and v. Graefe and Nagel have termed them essential phthisis bulbi. Nagel also has pointed out that such cases frequently occur associated merely with symptoms of slight ophthalmia. The anomaly of secretion in these cases is evidently founded on a transitory and often rapidly changing disturbance of the nerves in contrast to the phthisical softening of the globe caused by the disorganisation and partial destruction of the vessels. It is as yet completely doubtful whether the secretory anomaly is to be considered as a secretory or vaso-motor neurosis; as a phenomenon of irritation or of paralysis; as an affection of the sympathetic or of the trigeminus. Prof. Nagel has lately brought forward a number of cases in which a transitory diminution of tension—hypotony—formed a striking symptom. Graefe called attention to such diminution in chronic diffuse parenchymatous keratitis, and this has frequently been observed. There should be no complication of iritis or cyclitis. Phlyctenulæ are often associated with hypotony. A case of trachoma is narrated in which severe pain with diminished tension occurred, and was only relieved when the pupil became widely dilated with atropine. The symptoms recurred several times when the effect of the atropine had passed off. The chief

part of the paper contains examples of cases supporting the views of Prof. Nagel, advocated by him in a communication to the Heidelberg Congress in 1871. He stated that he had repeatedly observed cases of apparently mild ophthalmia, with a great diminution of tension without any considerable material participation of the external parts of the eye, especially without any change in the cornea or iris. No traumatic or other cause could be detected. Mostly only one eye was affected, sometimes both eyes alternately. In the cases recorded in the present paper there were marked local changes of temperature. In one case diminution of tension and attacks of pain were associated with lowered temperature while the pain lasted, and with raised temperature in the intervals; the bulb of the thermometer being placed on the closed eyelids or in the inner canthus, &c. The difference equalled 2° — 3° C. (4° to 5° F.). In some of the cases there was moderate ciliary congestion, in others phlyctenulæ, some slight injury, &c. The chief features are the diminished tension, injection of the conjunctiva, lachrymation, small pupil, pain, and elevation of temperature. The symptoms were relieved by morphia, atropine, warm moist applications, local abstraction of blood, &c. In a few cases these eye symptoms were associated with others pointing to a partial paralysis of the cervical sympathetic (half-sided hyperæmia, &c.). In one case, "the part of the neck near the angle of the lower jaw, corresponding to the position of the upper cervical ganglion, showed a complete want of sensibility upon pressure on both sides." The paper concludes with a comparison between the symptoms met with in the cases brought forward, and those noted in undoubted affections of the cervical sympathetic. (*Archives of Ophthalmol. and Otol.*, vol. v, Nos. 3 and 4, pp. 479—496.)

ON THE DEVELOPMENT OF MYOPIA; ON AN EASY METHOD OF MEASURING THE OPHTHALMOSCOPIC IMAGE, AND THE SIGNIFICANCE OF THIS MEASUREMENT IN ESTIMATING THE DIOPTRIC APPARATUS OF THE EYE.

By Dr. Leopold Weiss.—This paper is subdivided into six chapters, and extends over 124 pages in Graefe's *Archiv.*, Bd. xxii, Abth. iii.

ON ASTIGMATISM OF THE CORNEA.

By Prof. Ludwig Matthiessen. (*Graefe's Archiv.*, Bd. xxii, Abth. iii, pp. 125—130.)

ANOMALIES OF REFRACTION IN YOUNG PEOPLE.

Dr. A. v. Reuss gives a very detailed report on the state of the refraction of the eyes of a number of children in a school in Vienna. Not only are the relative conditions in one year stated

in a tabular and descriptive form, but the changes which he met with on examining the children again at the end of a year, and again at the end of another two years; that is, in 1872, 1873, and 1875. A great number of the children showed a much higher refractive condition (myopia) on testing with type than on ophthalmoscopic examination. We cannot reproduce the figures here. He found no difficulty in ascertaining the real state of the refraction by the ophthalmoscope without resorting to atropine, except in a very few. It is unfortunate that the question of treatment in the cases of so-called spasm of accommodation is not dealt with. He gives a table showing the different acuteness of vision in different cases of myopia, the degree of the latter being the same in each. He calls attention to the fact that in some cases of (apparent) myopia very little improvement may be caused by glasses till one in particular is tried, when the smallest letters may be read at once. He has occasionally met with cases where, on testing each eye repeatedly with glasses, he has obtained evidence of a much higher myopia than on testing both eyes together. He refers to Graefe's description of plesiopia as applying almost exactly to what is now called spasm of accommodation. (Graefe's Archiv., Bd. xxii, Abth. i, pp. 211—281.)

ASTIGMATISM.

On the analytical conditions of that form of astigmatic pencil in which the two focal lines are perpendicular, each to the axis of the pencil and also to each other, and on the correction of such pencil by a plano-cylindrical lens. By G. Hay, M.D. (Archives of Ophthalmol. and Otol., vol. v, Nos. 3 and 4, pp. 497—504.)

ASTIGMATISM.

In a communication to the Archives of Ophthalm. and Otol., vol. v, Nos. 3 and 4, p. 505, Dr. W. G. Dennett makes some remarks on the effects of astigmatism in distorting the view of the fundus, causing a deceptive resemblance to neuro-retinitis, &c., and advocates the use of correcting cylindrical lenses in the direct examination. He has constructed an apparatus to be added to the ophthalmoscope for this purpose.

A NEW METHOD OF ESTIMATING THE REFRACTION WITH THE OPHTHALMOSCOPE.

By Schmidt-Rimpler. (Zehend. Klin. Monatsbl., xv, Juni., p. 235.)

MODIFIED OPTOMETER OPHTHALMOSCOPE.

Dr. Baumeister describes and figures an ophthalmoscope with two discs rotating on one another, and allowing of 64 combinations, the interval between each being .5 dioptic. There is a

catch, so that the disc stops at each lens. (Zehend. Klin. Monatsbl., xv, April, p. 131.)

OPHTHALMOSCOPE FOR ESTIMATING REFRACTION.

Dr. Badal describes and figures one with two discs, placed one above the other, the edges meeting over the perforation in the mirror. The combinations allowed are 78. It is made by Roulot, and costs 32 fr. (Annales D'Oculistique, Nov.-Dec., 1876, p. 242.)

ON THE ESTIMATION OF THE ABSOLUTE REFRACTIVE POWER OF THE CENTRE OF THE CRYSTALLINE LENS.

By Prof. Ludwig Matthiessen. (Graefe's Archiv., Bd. xxii, Abth. iii, p. 131.)

THE STATE OF REFRACTION AND ACCOMMODATION BASED ON AN EXAMINATION OF 4,296 EYES.

A notice of a work by Emil Emmert will be found in Zehend. Klin. Monatsbl., xv, April, p. 148.

MYXOMA OF THE OPTIC NERVE—REMOVAL OF THE GROWTH WITH PRESERVATION OF THE EYEBALL.

Dr. Emil Gruening reports the case (Archives of Ophthalm. and Otol., vol. v, Nos. 3 and 4, p. 508). The result was good. The ophthalmoscopic appearances after the operation differed from what is recorded of Knapp's case, inasmuch as no obvious change could be detected, except that the veins and arteries became almost indistinguishable from one another.

ON THE OPERATIVE TREATMENT OF VASCULAR TUMOURS OF THE EYELIDS AND ANTERIOR PART OF THE ORBIT.

Dr. H. Knapp (Archives of Ophthalm. and Otol., vol. v, Nos. 3 and 4, p. 514) in (1) cases of cutaneous or subcutaneous nævi of the eyelids, not involving the cartilage and orbit, extirpates without hæmorrhage by using Desmarre's palpebral clamp; (2) cases of cutaneous or subcutaneous nævi involving the free edge and tarsal cartilage of the lid. Their total removal by the knife, &c., could not but leave a defect in the lid often combined with eversion and its injurious consequences. In some such cases he has operated as in the first class, *i.e.*, by removing only the epitarsal part of the growth, leaving the edge of the lid and the cartilage intact, and has seen the prolongations of the nævi in the cartilage shrink and completely disappear. He would always try partial extirpation first, restraining hæmorrhage by use of clamp. He recommends, without having tried, Dieffenbach's plan of removing successive wedge-shaped portions, cicatrization of the first wound having been allowed to take place before a second portion is dealt with; (3) cutaneous or subcutaneous vascular

tumours of the lids extending into the orbit, but leaving the tarsus and edges of the lids free. In these cases a horn spatula introduced into the conjunctival sac and pressed against the wall of the orbit checks hæmorrhage and presses the tumour forwards; (4) orbital vascular tumours involving important parts of the eyelids, tarsus, free edge, commissure. If the orbital portion be removed the palpebral will mostly shrink up.

Examples of all these forms illustrating the points of treatment are narrated.

EXOPHTHALMOS—PULSATING ORBITAL TUMOUR—LIGATURE ON THE COMMON CAROTID.

In the *Periscope* for Part I, vol. viii, p. 119, is an abstract of a case under the care of Dr. Oettingen of Dorpat. In *Zehend. Klin. Monatsbl.* June, 1876, p. 315, the conclusion of the case is given; the lad having died at the end of two and a half years. Contrary to expectation a solid tumour was found at the base of the skull in the left anterior fossa. The bone around was much eaten away. The tumour was fairly spherical, and bulged into the orbit. It was of tolerably firm consistence. It had a prolongation into the carotid canal. Microscopically the growth proved to be a fibroma. The tumour by pressure had caused hydrocephalus forming the swelling felt and seen during life. The absence of double optic neuritis is noteworthy. Photographs of the skull showing the extensive erosion are given.

BASEDOW'S DISEASE COMPLICATED WITH SARCOMATOUS TUMOUR OF THE BASE OF THE SKULL AND OPTIC NEURITIS.

Dr. Thos. Walzberg records the case of a man aged 20, who came under care for defect of sight, memory, &c., and pain in the neck and back of the head. There was well-marked but not extreme exophthalmos on both sides. The thyroid was much enlarged. The ophthalmoscopic signs were chiefly rather large veins, and swollen optic discs, which were of an opaque white colour. He died about a month after admission, and a detailed account of the post-mortem examination is given. There was a large tumour at the base of the skull, chiefly on the right side. In front the cavernous sinus was involved and the tumour projected backwards behind the sella turcica into the posterior fossa. When the base of the skull was looked at from below, the tumour presented at three points; into the pharynx, near the foramen ovale and the foramen lacerus arterius. The microscope showed the tumour to be a small-celled spindle-cell sarcoma. It was enveloped in a connective tissue capsule. The eyes were examined microscopically, and evidences of swelling and inflammatory products found. (*Zehend. Klin. Monatsbl.*, xiv, p. 401.)

DRAINAGE OF THE EYE BY WIRE SETON.

In Wecker's "Relevé Statistique," and in *Annales D'Oculistique*, Mars—Avril, 1877, p. 140, will be found an account of a new plan of drainage of the eye introduced by Wecker. The statistics include 58 cases in which he has employed wire-drainage. Detachment of the retina, 27; of the choroid, 1; glaucoma (absolute), 12; (inflammatory) 2; glaucomatous keratitis, 1; glaucomatous iritis, 1; hydrophthalmos, 5; staphyloma (ciliary), 1; (corneal), 5; sclero-choroiditis (anterior), 2; keratoglobus, 1; opacity of the cornea, 1. After some preliminary remarks on the history of previous attempts at drainage and the reasons for their failure, he says there are two points still undecided, (1) the length of sclerotic included between puncture and counter-puncture (8 to 10 mm. probably, '32" to '40"), and the method of fastening the wire in reference to tightness, pressure on the eyeball, &c. The wire should be drawn on at the moment of twisting it, to ensure that it should not project into the eyeball, but not tightly enough to damage the sclerotic. These remarks are made especially in connection with its application to detachment of the retina. The comprehension of the description of the procedure is facilitated by four figures. The instruments, &c., employed are (1) a curved needle, hollow, and 3 centim. in length (1'2"), analogous to the curved canula of a Pravaz syringe; (2) a thread of gold, 6 centim. (2'4") in length, bent at its centre so as to form a loop. The ends of this thread are to be passed along the needle nearly to its point; (3) a needle holder without a catch, having a groove which will hold the needle firmly (special contrivance); (4) a small pair of forceps with branches crossing each other (serrefils); (5) forceps with large branches for twisting the wire. The plan of procedure is as follows:—1st. To apply the wire. The lids are separated by speculum, the eye directed upwards, the conjunctiva, &c., seized with fixation forceps below and outside the cornea, and the eye drawn well up. The needle is then introduced between the inferior and external recti as near as possible to the equator, and brought out again so as to include about 1 centim. ('4") of the sclerotic between puncture and counter-puncture. As soon as the point of the needle presents through the conjunctiva (which is liable to be pushed before it rather than perforated by it) the fixation forceps are laid aside. The point of the needle is seized (without any hurry) by the fingers or the needle-holder, and whilst the extremity of the wire is then held the needle is withdrawn. The wire is thus left in position. 2nd step.—The extremities of the thread are seized carefully and crossed over the bridge of sclerotic. The small catch forceps are then used to hold the wire, the branches being so placed that one is above and the other below (not in front and behind); the forceps in fact lying in the direction of the needle

making the puncture and counter-puncture. The forceps are then allowed to hold by their own spring. 3rd. The ends of the wire are seized with the torsion forceps and twisted together. The wire is then cut off about 3 or 4 mm. ($\cdot 9''$ to $1\cdot 2''$) from the catch forceps, and the remaining piece bent in the form of a hook. The forceps being removed, the hook is bent down on the sclerotic so as to lie along the line of puncture and counter-puncture and not project from the globe. The wire is then gently drawn by forceps near the points of puncture and counter-puncture so as to ensure more accurate adaptation. In *Zehend. Klin. Monatsbl.*, xv, p. 91, is a further note. He alludes to seton in corneal margin. It must be shorter than the other, and a shorter and straighter needle is used. Also Note in *Graefe's Archiv.*, Bd. xxii, Abth. iv.

ACUTE GLAUCOMA FOLLOWING A SINGLE INSTILLATION OF ATROPINE.

The case is recorded by Dr. Hugo Magnus, and the patient was a man aged 72. The atropine was dropped in to facilitate a proper examination of cataract. The right eye only was affected though the drops had been put in both. The patient had been seen on two occasions before the atropine was used, and there was no occasion to suspect any glaucomatous condition. The symptoms came on within a few hours of the drops being used. (*Zehend. Klin. Monatsbl.*, 1876, xiv, p. 386.)

TATTOOING THE CORNEA, WITH REMARKS ON GLAUCOMA.

By Dr. J. Hock (*Archives of Ophthal. and Otol.*, vol. v, Nos. 3 and 4, pp. 382—392). In a case of extensive leucoma after several sittings for tattooing, a thin portion of the scar was tattooed. The next day pain extended from the eye to the side of the head, there was greatly increased tension of the globe, and vision was diminished. A corneal fistula which had previously existed was reopened, and the tension at once diminished. On several subsequent occasions tension recurred, and the fistula had to be reopened. He makes some remarks on the materials used for tattooing, the method of operating, &c., and then passes on to discuss what he regards as the most remarkable feature of the case, the glaucomatous condition of the eye coming first after the twelfth sitting, and the perfect restoration of the eye by artificial reopening of the corneal fistula. "There was increased tension four times in the course of the attendance—once, indeed, in the midst of a sitting. I could each time recognise that the lenticular apparatus was thrust forward; there was distinct bulging of the middle part of the scars; the lens could be pushed to and fro between the fingers pressed upon the inner part of the scar, and was evidently closely applied to its posterior surface." In discussing the cause of diminution of the anterior chamber he dis-

putes the theory of transudation through the cornea, as that would rather relieve the tension altogether. He thinks the fluid more probably transudes backwards. He narrates a case (compare abstract of Schnabel's paper) where a succession of circumscribed corneal opacities preceded glaucoma, and he was inclined to attribute the affection to irritation of the sensitive ciliary nerves. In the case in which glaucomatous symptoms came on during tattooing, he thought the onset could only be explained by a sudden excess of secretion in the vitreous. Whether this was the primary condition or only secondary to the admitted intra-ocular venous congestion, or the reverse order of events, he thinks cannot be definitely settled; but he inclines to the first view, because there is no clear pathological relation between venous congestion and irritation of the sensitive ciliary nerves, and there are many analogies which render probable the relation between irritation of the sensitive nerves and increased secretion. He calls attention to the fact that the thin tissue closing the corneal fistula, which only a few days before the attack had repeatedly given way to the vis a tergo of the retained fluid, remained unbroken during the glaucomatous attack. This observation he thinks peculiarly significant in view of the idea we form of the effect of intra-ocular pressure in cases of ulcerative perforation of the cornea, and it also throws a strong light upon the origin of such perforation under external pressure. Perforation of the cornea in acute glaucoma is generally followed at once by advancement of the iris and lenticular system; but in this case the escape of a drop of fluid was followed by recession of the lens and the scar, an argument that it was not so much aqueous as a retro-iridal fluid that made the trouble, and that in case of increased intra-ocular tension the vitreous volume is but the least increased. The curative effect of artificial interference proves that there were none of the conditions predisposing to glaucoma, but that the effects observed were due entirely to the multitude of little wounds.

GLAUCOMA AND IRIDECTOMY.

Dr. J. Schnabel writes at considerable length on this subject (*Archives of Ophthal. and Otol.*, vol. v, Nos. 3 and 4, pp. 342—381). He advocates the nervous character of glaucoma, and maintains that iridectomy relieves as a neurotomy does. He discusses the different views held as to the nature of glaucoma, and then passes to the various symptoms. He lays great stress on opacity of the cornea in contradistinction to opacity of the vitreous, whereas most authors consider the corneal affection insignificant. He asserts that opacity of the vitreous rarely occurs. He quotes Schweigger to the effect that the diffuse opacity of the cornea is the most apparent and important of the opacities of the different media in cases of inflammatory glaucoma, and that it is found early and constantly, while a simultaneous opacity

of the vitreous could never be demonstrated. Schnabel says he has found that when the media are too opaque to allow of the fundus being observed, there has been such a dense opacity of the cornea that the state of the vitreous could not be demonstrated, and that where the cornea was transparent he never found any opacity of the vitreous. The corneal opacity is most frequently found in the pupillary region. He narrates two cases where attacks of corneal opacity and dimness of sight occurred with increase of tension, but without any excavation, and in which the symptoms finally disappeared without an operation being performed. He also describes a similar series of attacks in a patient before iridectomy was performed for glaucoma. He also mentions a case where attacks of dimness occurred after iridectomy, but without any visible changes. He quotes a case recorded by Schiess in which dense opacity of the cornea had existed about five months before operation, and yet the cornea became quite clear subsequently. Schnabel regards the corneal opacity as due to secretion of a turbid fluid, as a neurosis of the secretory nerves. The pain present in glaucoma differs from that met with in inflammatory affections. A trigeminus neuralgia has preceded glaucoma (Hutchinson, Wegner, Hippel). Schnabel had a case where neuralgia of the trigeminus was the first symptom of glaucoma. The neuralgia is not the cause, but the consequence, or rather a symptom of glaucoma. The episcleral congestion will not alone avail as proof of inflammation. In reference to increase of tension and its cause, he discusses the various affections in which it occurs, and arrives at the conclusion that there must be distension or stretching of the ring at the sclero-corneal junction. He passes on to consider the opposite class of cases, where diminished tension occurs, in detached retina for instance, and attributes these to nervous disturbance. He sums up that the regulation of the conditions of secretion and absorption—the compensation in cases of accidental disturbances—belongs to the domain of nervous action, and a disturbance of this action must be looked upon as the cause of the permanent increase of the vitreous humour in cases of glaucoma, and of the permanent diminution of this fluid in cases of detachment of the retina and essential phthisis. The iridectomy reaches only those symptoms of glaucoma which are the expression of the neuropathy, and the more pronounced these are the more brilliant will be the effect of the operation. As to what nerves are diseased, we can only say that necessarily the fibres of the trigeminus are affected, and that an irritation of the fibres of the sympathetic is rendered very probable by the dilatation of the pupil; but we are not in a position to declare whether the increased tension depends upon the irritation of the trigeminus or of the sympathetic. It seems immaterial what part of the iris is removed, but it is certain that iridectomy remains ineffective when the incision lies in the cornea. It must be commenced beyond the sclerotic margin. It is very probable that we

have to look for the seat of the starting point of the morbid condition in the peripheral portion of the chamber.

Wecker and Stellwag consider that the scleral cicatrix possesses properties which render the further progress of the disease innocuous. Such explanations do not cover the whole of the ground, they attempt only to make intelligible the diminution of the tension. The iridectomy also abolishes other morbid phenomena independent of the tension, so that such theories lack in comprehensiveness. Many points of interest are touched on in the course of the elaborate examination of the symptoms connected with glaucomatous affections which cannot be noted in an abstract.

GLAUCOMA.

Dr. Max Knies contributes a paper on glaucoma to Graefe's *Archiv. f. Ophth.*, Bd. xxii, Abth. iii, p. 163. He gives an account of fifteen specimens of glaucomatous eyes in Prof. Becker's collection, with illustrations. 1. Glaucoma absolutum (total blindness from chronic glaucoma). 2 and 3. The same. 4 and 5. Glaucoma inflammatorium. 6. Retinal detachment, with consecutive choroiditis glaucomatosa, and hæmorrhage. 7. Amaurosis after glaucoma apoplecticum. 8. Cataracta tremulans, with detachment of the retina and secondary acute glaucoma. 9. Chronic glaucoma with corneal affection, hypopyon, &c. 10. Cataract, preliminary iridectomy followed by iritis and choroiditis glaucomatosa. 11. Amaurosis after glaucoma absolutum. 12. Glaucoma apoplecticum with staphyloma corporis ciliaris. 13. Glaucoma apoplecticum. 14 and 15. Chronic glaucoma. In some general remarks on the series he states that the pathological condition he found most constant, and in his opinion the most important one, was adhesion between the peripheral portion of the iris and the cornea, causing obliteration of the peripheral portion of the anterior chamber (Fontana's space). This was often due to a cellular growth between the iris and cornea, and could not, therefore, depend merely on the iris being pressed against the cornea. Occasionally this growth had contracted so as to shorten the anterior surface of the iris, and cause the pigmented posterior surface to be drawn forwards at the pupillary margin and present in front. In association with obliteration of Fontana's space there was invariably cell growth in and around the canal of Schlemm. The ciliary body and the subconjunctival tissue, and also the central part of the iris may likewise be infiltrated. In acute cases this almost always occurs; in others, and especially in the chronic ones, the inflammation may be strictly limited to the neighbourhood of Schlemm's canal. As this locality is the chief seat of the exit of fluid from the interior of the eye, and especially from the vitreous, it may easily be the seat of inflammation independent of any other part, and obliteration of the space of Fontana must lead to increase of the intra-ocular pressure. Further, if we establish the

fact that the cardinal symptom of glaucoma, increased intra-ocular pressure, is the necessary consequence of an indurating inflammation in the region of the canal of Schlemm, we shall also find that other symptoms, hitherto regarded as consequences of the pressure, may be more easily and satisfactorily accounted for. These are opacity of the cornea, anæsthesia of the cornea, iridoplegia, apparent shallowness of the anterior chamber, paralysis of the accommodation, and congestion of the veins of the anterior part of the sclerotic. The constancy of the last symptom in contrast to the uncertainty of the former ones also is in favour of glaucoma being due to an inflammation in the region mentioned. The corneal symptoms may readily be explained by the fact that owing to the obliteration of Fontana's space, passage of the aqueous occurs through the cornea in abnormal quantity, and interferes with its functions. This applies especially to acute cases, and as the cornea is only infiltrated with serous fluid, it may recover as soon as the cause is removed. In acute cases iridoplegia is rarely absent; in chronic ones, on the contrary, it may be wholly wanting. An inflammatory process, resulting in adhesion of the periphery of the iris, as is common in the chronic cases, may leave a mobile pupil. Increased pressure does not prevent conduction along nerves otherwise unaffected. The shallowness of the anterior chamber is probably in some measure only apparent, for the lens in the cases examined was not pushed forwards at all. The shallowness of the anterior chamber, that is the advance of the pupil, cannot be regarded as a necessary consequence of increased pressure, for injection of fluid into the vitreous caused as much tension in front as behind the lens, and the latter remained in position. In one of the cases, in which inflammatory glaucoma was present in one eye, inflammatory changes were found in the other eye around the canal of Schlemm, and there was also distinct "choked disc" (*Stauungs papilla*). It would appear, therefore, that in inflammatory glaucoma, at least, the choked disc precedes the stage of excavation. This is plausible, because increase of tension would obstruct the outflow of blood, and induce venous congestion of the retinal vessels, and hence prominence of the disc. This condition is only of short duration, however, but leads to diminished nutrition, and the latter in the later stages may cause cataract. The author does not wish to assert that every case of glaucoma can be explained by inflammation around Schlemm's canal, and adhesion of the iris and cornea, but in all the cases he has examined these conditions were present. Glaucoma is more common in hypermetropes than in myopes, and the shallow anterior chamber of the former would facilitate the formation of adhesion between the iris and cornea. The shallow anterior chamber of old persons would also aid the same process, though here other causes may come into play. Anterior synechiæ also, for the same cause, are more dangerous than posterior ones. He proceeds to discuss other theories of the causation of glau-

coma. He regards the inflammation around the canal of Schlemm as primary, and not merely secondary to increased ocular tension. He takes as the type of glaucoma the so-called chronic form. Obliteration of the space of Fontana of course leads to increased tension. The cornea can ill supply the increased demand for transudation. Associated with increased tension we also have diminished nutrition, and these two conditions lead to changes in the disc and lens. If there is added further increase of tension owing to nerve influence, then an attack of glaucoma results. In operating for glaucoma the author agrees as to the necessity for a peripheral incision. He suggests that possibly good results might follow incising the sclero-corneal junction from the anterior chamber subcutaneously, so to speak, by means of an instrument resembling a discission needle. Prolapse of the iris would be avoided more certainly than by any other procedure, and the troublesome retinal hæmorrhages which so frequently occur after iridectomy would be less common. His own cases afford no means of judging as to the effects of iridectomy, as the operation had only been performed in two.

TUMOUR OF THE CHOROID.

Dr. J. Hirschberg details the careful microscopic examination of a case of sarcoma in which the retina was also affected. Illustrations are given. Owing to the mode of cutting adopted, he was able to obtain sections of the parts *in situ* thin enough for microscopic examination. (Graefe's Archiv., Bd. xxii., Abth. i, p. 135.)

COLOBOMA CHOROIDEÆ OF EACH EYE WITHOUT ANY AFFECTION OF THE IRIS.

Prof. F. J. von Becker records a case with illustrations. He also notes a case in which one eye only was affected. (Graefe's Archiv., Bd. xxii, Abth. iii, p. 221.)

RETINAL HÆMORRHAGES AND MELANÆMIA AS SYMPTOMS OF AGUE.

By Dr. Stephen Mackenzie (Medical Times and Gazette, June 23rd, 1877, with illustrations).—The first case noted was that of a man aged 30. When admitted into the London Hospital, suffering from ague, recent hæmorrhages were found in the retina of each eye. They presented the streaky appearance so often assumed by hæmorrhages in this situation, and were chiefly seen along the course of the larger vessels, especially arteries which they in places obscured. Sprinkled about the fundus, and most numerous near the disc, were many small round bright spots, resembling pinholes pricked in a piece of paper held up against the light. The hæmorrhages faded away gradually. As each died

away, it left to mark its former situation one of the shiny white spots of which mention has been made. There was no albumen in the urine. The blood contained pigment. Subsequently a fresh hæmorrhage of a different character was detected. It was round in shape, with a sharply defined margin, and was of a uniform dark red colour. It was not at all streaky, like the others previously observed. It gradually altered in colour, the centre becoming first purple and then yellow, and much paler than the circumferential portion, whilst the latter became as it were frayed out. Other cases of ague at the Seamen's Hospital at Greenwich were examined, and hæmorrhages were found in two cases out of six who happened at that time to be in the hospital. The hæmorrhages are probably found in the early stages and acute cases. None of the patients complained of loss of sight.

PURPURA—PERIVASCULAR RETINAL HÆMORRHAGES—RECOVERY.

A case is recorded in the Medical Times and Gazette, March 3rd, 1877, under the care of Dr. Stephen Mackenzie. The patient was a lad aged 8. On admission there were spots of purpura on the extremities. There were no changes in the fundus oculi. Subsequently, Mr. Couper reported that "on a main branch of a retinal vein immediately above the disc are two minute portions, which appear, from their colour, comparatively empty of blood. They are bounded by normally filled portions of vessel. This seems due to the fact that the vessel is encircled by a collar of blood, beyond which is the pale portion of vessel. It must also be due in part to slight grayness of the retina over that part of the vessel." There was no reason to suspect embolism. There were four such spots altogether. All the large vessels had thickened sheaths. The appearances were similar in the two eyes. A few days later similar spots were found in the arteries, and one in the disc close to the *porus opticus*. The retinal hæmorrhages persisted long after all had disappeared from the skin. Dr. Mackenzie in some remarks appended to the case argues that the purpura was of nervous origin.

HÆMOPHILIA—PURPURA—RETINAL HÆMORRHAGES—PURPURA OF RETINA—DEATH.

In the next number of the journal Dr. Mackenzie publishes a case under the care of Dr. Andrew Clark. The patient was a girl aged 13. She had showed a considerable disposition to bleed from slight causes. Purpuric spots and bruises were noticed in various parts. At first there were no changes within the eyes, but a few days subsequently a large hæmorrhage was found in each eye near the disc and obscuring vessels. She died about a month after admission. The autopsy was forbidden.

THE COMMUNICATION BETWEEN THE RODS AND CONES AND THE INNER NUCLEAR LAYER OF THE RETINA, AND BETWEEN THE LATTER AND THE GANGLION CELLS.

Dr. R. Marcus Gunn contributes a paper to the *Journal of Anatomy and Physiology* (vol. xi, Part iii, p. 357), in which he describes and figures a mode of communication he believes he has discovered between the inner nuclear layer of the retina and the rods and cones and between the ganglion cells and the inner nuclear layer. From the study of sections of the human retina prepared with osmic acid, and subsequently hardened in alcohol, he has been able to trace the outer process of one of the bipolar cells of the inner nuclear layer through the external molecular layer immediately into the bulb of a cone-fibre. (Illustrations are given.) The connecting fibre, which is often tapering, generally passes to one of the edges of the bulb. It is sometimes comparatively broad and ill-defined, at other times finer but much more distinct, and may then take a somewhat wavy course, and have a more oblique direction; but it is possible these differences of appearance depend upon the aspect from which the connecting fibre happens to be viewed. Occasionally, but rarely, the bulb of a cone-fibre has seemed to receive two such processes, one at either side, and it is not unlikely that this may be the normal state of the case in all, the second connection having been severed in making the sections. In some instances the outer process of the inner nucleus bifurcates close to or within the substance of the external molecular layer. Mr. Hulke has shown that two separate fibres pass outward from the inner nucleus instead of a single bifurcating process. It has occasionally been possible to follow one at least of the resulting branches into the bulb of a cone fibre. Whether the other branch ends in a cone fibre or a rod fibre is doubtful. It seemed to split up into fine branches. In a solitary instance a direct communication was thought to have been seen between a branch of one of the ganglion cells and the inner end of one of the internal nuclei, and this nucleus again was by its outer process connected with the bulb of a cone-fibre. The cacao butter method of imbedding was employed. Great difficulty was experienced in making the plane of section exactly vertical to the surfaces and corresponding with the direction of the inclination of the fibres of the retina.

Prof. Fr. Merkel has been working at the same subject, and his observations seem to confirm the above. His paper is in *Bd. xxii, Abth. iv, of Graefe's Archiv.*, p. 1-23. He has arrived at his results not by making sections but by tearing. He uses osmic acid and an alcohol-glycerine watery solution. He thinks the only way of arriving at certainty is by tearing out a single preparation reaching from the rods and cones to the inner nuclear layer. He wanted a macerating solution which would not

destroy the connection between the outer and inner parts of the retina, but would render the outer molecular layer transparent enough to show these processes. He finds the cone-fibres have sheaths, and the lower end terminating at the outer molecular layer when exposed to view shows a section as of an axis cylinder and its white substance. These appear as rings when the outer molecular layer is looked at from the surface, not in section. In section they look like an interrupted line—a series of dashes. The fibres connected with the rods are so delicate that it was difficult to trace them. He believes he has traced fine processes however from the inner nuclear layer to the rods. He has not paid much attention to any connection between the ganglion cells and the inner nuclear layer, looking on the matter as a foregone conclusion, but he has seen many fine processes which he has no doubt go to the inner nuclei. The processes pass a long way obliquely or horizontally through the inner nuclear layer. The author concludes with remarks on the framework of the retina.

THE HUMAN RETINA.

Fr. Merkel contributes a paper giving a summary of our present knowledge in *Zehend. Klin. Monatsbl.*, xv, Juni, p. 205—226.

GLIOSARCOMA OF THE RETINA FOLLOWING AN INJURY.

The patient was a lad aged 15. The other eye was threatened with sympathetic inflammation when the globe was removed. A section of the globe is shown. A detailed account of the history and histology of the specimen is given by Dr. Walzberg (*Zehend. Klin. Monatsbl.*, xv, Mai, p. 172—189).

RETINAL PULSATION.

Dr. Jos. Jacobi in the first of a series of papers on the circulation within the eye deals with the retinal pulsation. In reference to the *venous* pulsation, he says: (1.) It is of no pathological importance, being purely physiological. (2.) The diminution of the vein is synchronous with the cardiac systole. (3.) The phenomenon is only perceived on the disc, or at any rate within its immediate neighbourhood. Occasionally, at the same time that the vein diminishes in size, a distinct enlargement of the part of the vein close to and on the peripheral side of the pulsating portion may be detected. (4.) Excepting in the retinal veins, no such phenomenon is observable within the eye. The choroidal veins especially show no rhythmical alteration in colour. He then discusses the theories of Coccinus and of Donders in reference to the production of this pulsation. The former holds that the sudden influx of arterial blood exercises pressure most easily on

the veins, and the outflow of blood by them is therefore expedited. Donders thinks the pressure is exercised through the vitreous on the parts where the lateral blood pressure is least, that is, the large venous trunks, and that in consequence they will be compressed and the outflow of blood hindered. The choroidal vessels are said to be protected by peculiar anatomical conditions. The fact that increased pressure on the part of the vitreous never *per se* favours the exit of blood, but on the contrary retards it, is opposed to Coccius' theory. Against the second theory may be urged the necessity of supposing a peculiar anatomical condition of the choroidal veins. The limitation of the pulsation is difficult to explain on either theory. The author is inclined to look as Graefe and Jäger did, to conditions met with in the disc and nerve as the proximate causes of the phenomenon. He then describes the anatomy of the physiological cup and the course of the vessels. It is when they curve sharply, forming a point or knob, or there is a kink that spontaneous venous pulsation is generally seen. The physiological cup is the part which is most likely to yield to pressure. If, therefore, there really is any systolic increase of pressure on the vitreous, the shape of the cup will be altered. It will be deepened and widened. This alteration will not affect the arteries perceptibly on account of their thicker walls and the blood pressure; whilst the veins will be easily influenced. They will be elongated and stretched and pressed laterally, and at certain parts bent sharply, and thus an additional impediment to the circulation will be afforded, and their calibre diminished. The central portion of the vein must collapse. The degree of the collapse will depend on the abruptness of the bend and the increase in the intra-ocular pressure. Immediately after the cessation of the dilatation of the arteries, the elasticity of the disc will enable it to resume its former shape, and the obstruction to the venous flow will be removed. He gives his reasons for believing the disc to be the "*locus minimæ resistantiæ*." In favour of his hypothesis he quotes the results of ophthalmoscopic examination. In addition to this so-called pulsation, which is really not a pulsation, but a phenomenon *sui generis*, a true pulsation may be met with. In a case recorded by Reynaud, the retinal veins pulsated to their smallest branches. Another and peculiar case is recorded by Becker. In reference to the arterial pulsation, he remarks that it is generally taught that there are two forms, a true pulsation met with in cases of insufficiency of the aortic valves, &c., and also a mere intermittent flow of blood into the eye (glaucoma, &c.), where there is increased pressure within the eye. The first is characterised by systolic enlargement or elongation (movement) of the arteries, the other by diastolic pallor of the disc. The author doubts whether these two forms are sharply separated. The eye of an albino rabbit is well adapted for observation. He thinks both forms come under the designation of a true arterial pulsation, and

in each the pulsation consists essentially in a continuation of the systolic arterial wave into the ophthalmoscopic field. Pressure on the eyeball not only produces local anæmia, but the obstruction to the circulation causes increased blood pressure and pulsatile movements in the different arteries before their entrance into the eyeball. These increased pulsations are continued for a certain distance within the globe. (Graefe's Archiv., Bd. xxii, Abth. i, p. 111—134.)

GLIOMA OF THE RETINA AND OF THE OPTIC NERVE.

Dr. Baumgarten narrates in detail the history, &c., of a child with glioma, under the care of Dr. Jacobson. The microscopic examination of the enucleated eyeball is entered into fully, and the question discussed whether the growth was primarily of the retina, or of the nerve. (Graefe's Archiv., Bd. xxii, Abth. iii, pp. 203—220.)

RETINITIS PROLIFERANS.

Under this term, Prof. W. Manz records three instances of a very remarkable state of things in the fundus oculi, of which he gives two illustrations, and which has also been represented in Pl. LV of Jæger's large atlas. Here, however, it is regarded as an affection of the vitreous. In Prof. Manz's cases there were opacities in the vitreous; but the chief change consisted in whitish, filmy opacities, apparently retinal, extending in a direction chiefly upwards and downwards, in the neighbourhood of and involving the disc. The retinal vessels were partially but not wholly concealed. (A further abstract will probably be given in another number.) (Graefe's Archiv., Bd. xxii, Abth. iii, pp. 229—275.)

RESULTS OF EXAMINATION BY SPECTRUM ANALYSIS IN A CASE OF COLOUR BLINDNESS.

Dr. W. Camerer reports a detailed examination of his own perception of colour in the spectrum. (Zehend. Klin. Monatsbl., xv, Feb., pp. 51—60.)

HEMIOPIA AND AFFECTIONS OF THE OPTIC NERVES.

Prof. Schweigger (Graefe's Archiv., Bd. xxii, Abth. iii, pp. 276—323) gives details of 29 cases of lateral hemiopia, with diagrams of the more peculiar fields of vision, and of 11 other cases of various defects of the field of vision. In two cases there was a defect of the upper half of the field in each. In three cases there was limitation to a very small central field. In the first of these, the discs were white, and the arteries diminished; in the second, there was atrophy with excavation, but without increase of tension; in the third, there was atrophy of both optic nerves. In two other cases of atrophy there were defects of field limited by

line passing through point of fixation. Defects of the temporal half of each field are not uncommon in affections of the optic nerve. He gives two cases. One case of defect of the nasal half of each field is detailed, and another in which the lower half of one field was wanting in an affection (partial) of one optic nerve. Though all trace of any affection of the optic nerve may have disappeared, the defect of the field may persist. Cases of symmetrical defect of field with visible changes in the fundus should not be grouped under "hemipia." The latter name should be restricted to defects coming on suddenly, and without any ophthalmoscopic changes, and mostly in connection with apoplexy.

ABSOLUTE AMAUROSIS FOLLOWING INJURY WITHOUT OPHTHALMOSCOPIC CHANGES.

The patient was 17 years of age. He received a blow from an iron bar on one eye. The sole defective sign was dilatation of the pupil. There was no perception of light. (Prof. Dr. Laqueur, *Zehend. Klin. Monatsbl.*, Juni xv, p. 231.)

AMBLYOPIA WITHOUT OPHTHALMOSCOPIC CHANGES—RETRO-OCULAR NEURITIS.

Herm. Schmidt-Rimpler records the case of a young woman who had had almost complete amaurosis for more than a year. Strychnine injections were tried without effect; then applications of the artificial leech. The pupils began to act, and then hyperæmia of the disc was noticed. Inunction of mercury was tried. Ultimately complete recovery resulted. In another case, the patient a man aged 28, great defect of sight was associated with only slight œdema and hyperæmia. Subsequently well marked atrophy developed, but the sight improved. (*Zehend. Klin. Monatsbl.*, xv, p. 165.)

AMAUROSIS IN CONSEQUENCE OF LOSS OF BLOOD.

Dr. Landesberg records one case of double amaurosis from hæmatemesis, one case of monocular blindness from metrorrhagia, and another from epistaxis. In the first case, the patient was not seen for 18 months. The discs were in a state of advanced atrophy. In the second, the affection was not noticed for a fortnight after the loss of blood. There was partial atrophy. In the third case, the eyes were examined on the following day. Both eyes were then in a state of slight neuro-retinitis, but the one recovered whilst the other developed well-marked neuro-retinitis with hæmorrhages, and subsequently passed into atrophy. (*Zehend. Klin. Monatsbl.* xv, Feb., p. 95.) See *Periscope*, vol. viii, Part ii, p. 386.

SYMPATHETIC INFLAMMATION SET UP BY AN ATROPHIED GLOBE
AFTER GONORRHOËAL OPHTHALMIA.

A girl aged 18, had gonorrhœal ophthalmia of both eyes, ending in complete recovery of one and atrophy of the other at the end of a month. In another fortnight, she remained in same state, but in another month (ten weeks after ophthalmia), both eyes were painful, and the recovered eye showed serous iritis. In the atrophied globe, there was extensive prolapse and adhesion of the iris which had set up cyclitis. Enucleation of this globe and the thorough use of atropine ended in almost complete recovery. The case is recorded by Dr. Meyhoefer in *Zehend. Klin. Monatsbl.*, vol. xv, März, p. 102.

ON THE ACUTENESS OF VISION IN RELATION TO THE ILLUMINATION.

Anton Posch, of Innsbruck, contributes a paper on this subject to the *Archives of Ophthal. and Otol.*, vol. v, Nos. 3 and 4, p. 297-332.

THE ANATOMY OF THE EYES OF ARTHROPODA.

By Dr. H. Grenacher.—Appendix to the Mai number of vol. xv of *Zehend. Klin. Monatsbl.* (with illustrations).

AN HISTORICAL ACCOUNT OF THE VARIOUS REPRESENTATIONS
GIVEN AT DIFFERENT TIMES OF THE ANATOMY OF THE HUMAN
EYE, WITH ILLUSTRATIONS RANGING FROM PEYLIGK, 1499, TO
SÖMMERING, 1801.

An appendix to the Juin number of vol. xv of *Zehend. Klin. Monatsbl.*, by Dr. Hugo Magnus.

ON VISUAL SENSATIONS.

A long critical review of a series of papers by Hering is given in the *Annales D'Oculistique*, 1876, Juillet-Août, p. 54. In the number for Sept.-Oct. is a detailed account of papers on the Physiology of the Retina, by Dobrowolski and A. Gaine.

RETINITIS PIGMENTOSA.

An article by MM. Warlomont et Dumez on this subject from the *Dict. Encyclop. des Sciences, Méd.*, is given in the *Annales D'Oculistique*, Sept.-Octob., 1876, p. 113.

LIST OF PAPERS IN THE REPORT OF THE FIFTH INTERNATIONAL OPHTHALMOLOGICAL CONGRESS.

On the use of a Naso-Buccal Flap for Blepharoplasty.—By Henry D. Noyes, M.D. (with illustrations), p. 6.

Chronic Optic Neuritis. By W. A. Gowers, M.D., p. 14.

Coloboma Lentis. By Albert G. Heyl, M.D., p. 16.

Additional Means of Relieving Pressure of the Eyelids in Diseases of the Cornea.—By Henry D. Noyes, M.D., p. 29 (with illustration).

On Sympathetic Neuro-Retinitis.—By Adolf Alt, M.D., p. 37.

On Orbital Tumours.—By W. Knapp, p. 51.

A case of Choked Disc under Observation three years and a-half without Change in Appearance or Progressive Impairment of Vision.—By Arthur Matthewson, M.D., p. 63.

The Introduction of the Meter Measure for the Determination of Lenses.—By Prof. A. Nagel, p. 66.

The Detachment of Posterior Synechiæ.—By B. Joy Jeffries, M.D., p. 66.

The Optical Error of Conical Cornea with Report of two Cases treated by Operation.—By Henry D. Noyes, M.D., p. 72.

Ophthalmoscopes with the Metric System.—By E. G. Loring, M.D., p. 81 (with illustrations).

The Halo round the Macula Lutea.—By E. G. Loring, M.D., p. 86 (with illustrations).

Hypermetropic Squint and Insufficiency of the Internal Recti.—By E. Hansen, M.D., p. 103.

Operation for Cicatricial Entropium.—By John Green, M.D., p. 126.

On Bony Formation in the place of the Lens.—By P. De Keyser, M.D., p. 131.

Trachoma as influenced by Race.—By Swan M. Burnett, M.D., p. 134.

The Relations of Blepharitis Ciliaris to Ametropia.—By D. B. St. John Roosa, M.D., p. 137.

Analysis of 1,079 recorded cases of Ametropia and Muscular Weakness, with Deductions respecting Asthenopia.—By Henry D. Noyes, M.D., p. 148.

Analysis of 1,060 cases of Asthenopia under care of Dr. Agnew, p. 214.

On Treatment of Asthenopia by means of Regular Systematic Exercise.—By E. Dyer, M.D., p. 227.

Case of Ectropion cured by Transplantation of a large piece of Skin from the Fore-arm.—By O. F. Wadsworth, M.D., p. 237.

A convenient method of applying Warmth to the Eye.—By Dr. F. Buller, p. 240.

Remarks on the Ciliary Muscle.—By E. G. Loring, M.D., p. 243 (with illustrations).

Sub-conjunctival Cysticercus.—By Charles J. Kipp, M.D., p. 250.

On Inherited effects of Lesions of the Sympathetic Nerve and Corpora Restiformia on the Eye.—By Dr. Dupuy, p. 252.

Filamentous Body present in the Anterior Chamber.—By Dr. Argyll Robertson, p. 256 (with illustration).

Case of Recurring Sarcomatous Tumour of the Orbit in a Child; extirpated for the third time, and ultimately causing the death of the patient.—By Dr. Thomas Hay, p. 258 (with illustrations).

Metrical Ophthalmoscope.—By H. Knapp, p. 263.

PAPERS IN ANNALES D'OCULISTIQUE FOR JAN.-FEV. AND
MARS-AVRIL, 1877.

F. C. Donders.—*A Developmental Explanation of the Ocular Movements*, pp. 5 and 97.

Teillais.—*Three cases of Rupture of the Choroid* (with woodcuts), p. 26.

L. de Wecker.—*The use of Ésérine in Ophthalmic Practice*, p. 31.

Warlomont et Duwez.—*Etiology of Neuro-Retinitis*, p. 114.

TITLES OF PAPERS IN GRAEFE'S ARCHIV., BD. XXII, ABTH. IV.

On the Histology of the Lens.—By Ritter, p. 26.

On Binocular Indirect Vision.—By Dr. W. Schön, pp. 31—62 (with illustrations).

Results of the Examination of the Eyes of School-children at Luzerne.—By Dr. Pflüger, pp. 63—117.

On the Theory of Vision.—By J. Hirschberg, pp. 118—125.

Cases of Cysticercus Cellulosæ in the Fundus of the Eye. With illustrations, pp. 126—135.

Contributions to the Pathological Topography of the Eye.—By J. Hirschberg. No. iii. *Sympathetic Irritation and Inflammation*, pp. 136—146.

Supplement to a Paper "Studies on the Field of Fixation," in former number (see *Periscope*, vol. viii, part iii, p. 623).—By Dr. Schneller, pp. 147—156.

Clinical Contributions to the Study of Glaucoma, and especially to our knowledge of the Mode of Origin of the Pressure Excavation.—By Dr. S. Klein, pp. 157—208.

Glaucoma and Drainage of the Eye.—By Dr. Wecker, pp. 209—14.

On Calabar Bean and its Therapeutic Employment.—By Dr. Adolph Weber, pp. 215—232.

On Detachment of the Retina and its Causes.—By E. Rachlmann, pp. 233—252.

The Royal London
Ophthalmic Hospital Reports,
and Journal of
Ophthalmic Medicine and Surgery.

VOL. IX. PART 3.

DECEMBER. 1879.

PART I.
Original Contributions.

CLINICAL GROUPS OF CASES OF AMAUROSIS.

By JONATHAN HUTCHINSON.

(Continued from Vol. IX, Part II, p. 130.)

GROUP IV.—NEURITIS AFTER OTORRŒEA, &c.

Case 52. Neuritis following Injuries to the Head—Neuritis from Disease at Base, spreading from Middle or Internal Ear—Neuritis from Cerebral Hæmorrhage.*

F. 415. Job B., 42.

Amaurosis and neuritis, with severe headache; imperfect symmetry, rapid onset, subsequent improvement. Headache chiefly on R. side for a year before failure. R. eye worse than L.

History of abscess and discharge from L. ear and temporary paralysis of L. facial nerve (leaving permanent traces) 2 years before V. failed.

Intraocular changes very slight.

Improvement of R. from no p. l. to 19 J. Improvement of L. from 19 J. to 1 J. and $\frac{20}{20}$.

No proof of syphilis.

Case 53. F. 342. Edith S., 5.

Failure of V., with neuro-retinitis (deep-seated haze of discs and white deposits in retinae), followed by atrophy.

Preceded by severe cerebral symptoms, violent sickness and headache, and partial R. hemiplegia, affecting the lower limb and the R. face and muscles of R. eye.

Perfect recovery except as to V.

The illness probably symptomatic of disease spreading from L. ear. There had been otorrhœa following measles for many months before the illness began.

Urine. no albumen or sugar.

Case 57. O. H. R., V. 105, B. 189 and 276. Walter S., 28.

Amaurosis and atrophy with diminished arteries and jagged choroidal rim after double optic neuritis. Death 14 months after symptoms began. No syphilis. Blow on head some years before.

Chronic meningitis at base of brain, matting nerves together; general softening of brain.

1864, January. Failure of V. Severe pain over eyes for a week or two.

May. Slight attack of L. hemiplegia and incoherent speech.

June.

July.

August.

September.

October.

November.

December.

1865.—January.

} Very severe headache, often causing a semi-comatose state.

} Improved in health. Loss of smell and taste.

February. Frequent fits.

February 20. Died.

Case 58. G. 283. Frederick E., 23.

Slight neuro-retinitis of R., with moderate defect of V., accompanying paralysis of L. 3rd and 4th nerves; all these symptoms coming on about 3 months after a blow on L. eye by a fist.

L. eye defective for long, and shows rather doubtful evidences of past neuritis.

Probably had syphilis 5 years ago.

I ? Node involving L. 3rd and 4th nerves and optic tract.

II ? Double neuritis from "coarse disease," causing pressure on L. 3rd and 4th nerves, but not involving optic tract.

GROUP V.—AMAUROSIS AFTER INJURIES TO THE HEAD, OR TO 5TH NERVE.

Case 56. Fracture of Base of Skull—Hæmorrhage, Concussion, Convulsions, and Partial Paraplegia—Loss of Speech (Language) and Sight.

B. 100. (Dumbness, p. 16, Astley Cooper Prize Essay.) Harriet L., 25.

Amaurosis (bare p. l.) of both, and complete dumbness after a prolonged convulsive seizure, which followed about 10 days after a severe injury to head (fall from window).

The injury caused several hours' unconsciousness, and there was vomiting of blood.

There was paresis of lower extremities (? of arms also), and she was unable to stand for 3 months, but no affection of sphincters.

Pupils too small. Eyes kept shut. No paralysis of any ocular muscles, but spasm of *occip. frontalis* when she tries to open the eyes. No ophthalmoscopic note. Hearing and intelligence good. There was suspicion of malingering, and she was put under chloroform, but she never spoke, although efforts were made to induce her to do so.

Case 59. B. 315. Ann W., 8½.

Amaurosis (partial), with partial simple atrophy of discs. No evidences of ocular neuritis. V. large print at 3 inches.

Following about a month after a fall on the head, which caused sickness and temporary loss of consciousness, but no other immediate symptoms.

Failure of sight not accompanied by any other symptoms.

Case 60. B. 213. William C., 30.

Amaurosis and atrophy of disc coming on many years after injury to the eye. The injury causing rupture of choroid.

1852. L. eye struck by a key. "Quite blind for 6 months."

Gradually regained enough sight in the injured eye to be able to read.

1863-4. Gradual failure of L. again to total blindness. Atrophy of disc and great diminution of arteries. Old ruptures of choroid. Slight displacement of lens. Posterior synechiæ.

Case 61. B. 212. ? Published. Ambrose H., 49.

Gradual failure 4—5 months, L. much the worse.

Wound of L. frontal nerve 5 years ago.

3 years ago, was, for a joke, hung by his comrades until insensible, and was so ill afterwards that his surgeon advised that his deposition should be taken.

No ophth. details.

Case 62. Immediate, total, and permanent Blindness as the result of a fall on the Head, which occasioned only slight concussion injury to one shoulder.

B. 156. William C., 40. Railway guard.

No perception of light. Milk-white atrophy of discs and great diminution of retinal arteries; has been blind about a year. A year and three-quarters later he was in just the same state.

It was a railway accident, and he was within an ace of being crushed by a slowly-moving train.

All his other organs and functions were perfect throughout.

Case 63. Amaurosis following injury to 5th Nerve.

O. H. R., IV, 125 (B. 17). Benjamin B., 52.

Gradual failure of one eye with deafness of same ear, and paresis of corresponding 5th and facial nerves, after severe lacerating blow on jaw and forehead of same side.

Ophth. doubtful, slight pallor of the amaurotic disc. V. 20 J. barely 3 months after accident.

? Absorption of orbital fat.

Case 64. F. 25. Joseph B., 56.

Atrophy of disc going on to all but complete blindness, coming on gradually during many months, and beginning about 9 months after a fall on back of head. Some slight affection of speech and breathing, as if from paresis of soft palate.

Other eye lost many years by injury.

Asserted (probably pretended) loss of smell and taste from the date of the injury.

Case 65. F. 19. Jno. W.

Æt. 5. Fell in the street, and struck R. forehead. Became insensible in an hour or two, and remained so 14 days.

Bled a little from ear and nose.

Expected to die.

Blindness found out 1 month after accident.

Paralysis of L. side was present 3 months after accident.

9 months after accident, R. eye said by Mr. Critchett to be worse than L.

Æt. 14. V. 20 J., barely. Atrophy of discs, more in R.

Æt. 19. V. the same; practically blind.

Case 66. ? Optic Atrophy from injury to one 5th Nerve.

G. 264. John D., 47.

Failure of L. to absolute blindness in 2 months, with pain, 8½ years after contused wounds of L. temporo-malar region.

Excision.

Failure of R. eye without pain shortly after L. had become blind; going on to bare p. l. in about 4 months.

A year after failure began, advanced atrophy of disc and some diminution of arteries. No strong evidence of neuritis.

Cornea slightly hazy.

Case 67. O. II. R., VII, 45. C. 105. Jeremiah S., 66.

Atrophy of L. O.D., and nearly complete blindness (V. shadows), vessels much diminished; and complete deafness of L. ear; after severe blow on head by a falling tree which laid him up for 10 days. Date of failure of V. in relation to accident not stated, but probably immediate, or soon after. The deafness was immediate.

History of partial L. hemiplegia for a long time after the accident.

Seen 12 years after the accident on account of corneal ulcer of the other eye.

Case 68. C. 6. Wm. D., 45.

Pitched out of a cart on to top of head. Bled severely from nose and probably from ears.

Insensible "for a fortnight."

Recovery 1 month after accident with—

i. Irregularity from fracture of floor of R. orbit and R. squamous temporal bone.

ii. Absolute loss of smell.

iii. No p. l. in L. eye.

iv. Defect of R. eye.

12—14 months later—

L. no p. l.; advanced atrophy.

R. imperfect, but he thinks a little better than a year ago.

O.D. pale, but not so white as L.; whiter on *y. s.* side.

Complete loss of smell.

Taste and hearing good.

Case 69. L. H. R., I. 55 (and B. 122), *Case 34.* Geo. S., 55.

Amaurosis with atrophy slowly progressing to total blindness; L. failing before R. and becoming blind earlier.

Disks grey-white; arteries somewhat diminished, but not greatly so.

Failure began soon after a fall on back of head, causing concussion and unconsciousness for a few minutes.

Health good.

Condition of eyes and health the same 4 years and 6 years after he became blind.

He was about 3 years in going blind.

A great smoker.

Case 70. Andrew B., 42.

18 months ago. Injury to R. side of head, a graze by very heavy mass of iron. Not thought serious.

1 week later began to see double and his R. ear swelled. Diplopia very soon went off and R. eye found to be nearly blind. V. went in about 8 days.

Now. R. bare p. l.; O.D. pale, vessels n., or but slightly diminished. L. $\frac{2}{3}$ o. Slight haze on *y. s.* of O.D. only; colour n.

Other symptoms since the accident;—

Hyperæsthesia of R. side of head; constipation for last 12 months; stiffness and "soreness" of hips and legs if he sits still. Slowness of ideas. Failure of sexual appetite.

History of swelling of R. leg and thigh after the injury to head. No syphilis.

This case was possibly one of loco-motor ataxy in early stage, and the injury only a coincidence.

Case 71. Bag and B. 22. Elizth. K., 9.

Complete blindness of R. eye without any visible change in O.N., retina or choroid; p. active.

Blindness followed immediately or soon after a violent blow on the eye with a stick, which caused much bleeding, 6 months before admission. No evidence of malingering.

Case 72. L. H. R., i, 53, Case 27 (and B. 60). Isaac Waters, 49.

Progressive amaurosis, not quite symmetrical, but ending in all but total blindness of one eye, and absolute of the other, beginning shortly after a severe blow on back of head, causing insensibility for a few minutes. No other symptoms.

Case 73. B. 26. William W., 35.

Failure of V. within a week or two of a severe blow on head by 12 lb. weight, falling 11 feet. Insensible 20 minutes.

Much pain in head.

Atrophy of R. o. d. 13 weeks after accident.

L. o. d. good colour. This eye was defective before accident; old choroido-retinitis.

Case 74. ? Intraocular Neuritis of R. as the result of a blow, ascending and affecting L. at Commissure.

G. 391. Wm. F., 47.

Atrophy of both, with evidence of former neuritis in R., but not in L.; almost complete blindness.

Failure moderately gradual. R. failed several months before L., and was first noticed immediately after a severe blow on the eye by a piece of wood.

Probably paralysis of accommodation.

Probably had syphilis 21 years ago.

Sleepiness, but no other constitutional symptoms.

GROUP VI.—NEURITIS FROM THE PRESSURE OF INTRA-ORBITAL TUMOURS.

The three following cases are chiefly important as proving the occurrence of neuritis in one eye from pressure

upon the trunk of the optic nerve within the orbit. In many cases of proptosis, it would appear that the nerve may bear considerable pressure and stretching without any evidence of swelling of the disc.

Case 75. (C., p. 255). C. W., 33, married man. Neuritis with only moderate effusion in one eye only, probably due to pressure on optic nerve by node in orbit. Proptosis and swelling of lids. V. improved greatly with iodide of potassium.

Syphilis 7 years before.

He had a fit subsequently.

Case 76. (O. H. R., VII, p. 611). Thomas T.

Optic neuritis with proptosis from intra-orbital melanotic tumour.

Case 77. G. 323. Thomas L., 59.

Neuritis in one eye from pressure of pulsating tumour in orbit.

GROUP VII.—CASES OF OPTIC NEURITIS IN WHICH THE CAUSE WAS NOT ASCERTAINED. ALSO SOME CASES OF NEURO-RETINITIS FROM RENAL DISEASE, OR ASSOCIATED WITH GOUT, &C.

Optic Neuritis from Uncertain Cause.

Case 78. C. 278. John H., 37.

Neuritis (woolly discs) with absolute blindness, preceded by photopsiæ. Loss of V., progressing to blindness in 3 months. Ps. medium, equal, quite fixed. Very little headache until after the loss of V. Since then liable to attacks of most intense jumping headache, sometimes causing loss of consciousness. Attacks lasting a few hours and then ceasing entirely. Coming on at intervals of from 2 or 3 days to several weeks. Occasional pins and needles in face, and attacks of trembling and loss of use of L. limbs.

Case 79. F. 16. Jas. W., 37.

Gradual failure of V., with great pain in forehead.

“Neuritis in both” noted about a year after failure began, but

notes incomplete; there is some account of a temporary failure a year ago, followed by recovery and a more recent relapse.

Five years after the notes were taken, he was in good health but quite blind.

Case 80. F. 108, and O. H. R., viii, 495, Pt. iii. Wm. P., 58.

Double neuritis, ending in partial atrophy, but with great improvement of sight. History of a previous temporary failure, and of several attacks of hemiplegia. Doubtful syphilis 40 years ago.

Case 81. B. 65. Mary C., 42. (August, 1862.)

Left hemiplegia, with pain in shoulder and hip, and then in scalp; next, symmetrical neuritis, with total loss of sight. History of variations of sight. Gray discs and small arteries. *No p.l.* Intense frontal headache.

Admitted in August, 1862. She had perfect sight until the previous Christmas (1861). She first noticed that her eyes were failing, and "she was getting dark." She then had "the cruellest pain in her forehead, as if there was something between the skin and the bone." She had had ten children, five of whom were living. She always had good health before her present illness, and was never subject to headache. About two years ago, one hot summer day, she walked seventeen miles, and then drank some cold water. She slept very badly the following night, and, a fortnight later, "pins and needles came in her left arm." She had afterwards great pain in the left shoulder and left hip, and then "the pain went to the crown of her head." Her husband and she differed as to whether it was two or four years since she became paralysed, but both agreed that it followed the occurrence referred to, and came on gradually. She had only been two months blind; and it was a remarkable point that sometimes her sight had greatly improved, and then again wholly failed. Although now quite unable to perceive light, she still asserted that even yesterday "for a few moments she could see into the yard, but she could not keep it."

The pupils were of large size, and quite motionless; the aspect was amaurotic. She was quite paralysed in her left arm and leg, which hung useless. She could feel in the hand, but only very imperfectly. With great difficulty I got a glimpse of the optic disc in the right eye. It was not white, but of a mottled grey specked with black, very ill defined. The arteries were small; the

veins of moderate size; the choroid normal; the pupils were widely dilated.

There can be little doubt that in this case all the symptoms—the loss of sensation, loss of motion, neuralgic attacks, and final symmetrical failure of sight—were due to some central cause.

Case 82. B. 128. John B., 44.

Amaurosis from neuritis followed by atrophy, more advanced in R. than L., in connection with pain in head, giddiness, deafness in R. ear, and paresis of R. 5th N. Deafness and giddiness 3 years. Paresis of 5th N. 1 year. No syphilis.

Note of condition being the same some months later.

Case 83. B. 207. Hy. O., 45.

Double optic neuritis, swollen, fluffy discs, with great defect of V. (20 J.), of probably 5—6 months' duration; gradual improvement up to 6 or 8 J., with absorption of lymph, but retinal vessels remaining much diminished, and discs grey. Failure of V. preceded by diplopia and headache, chiefly frontal; and some paralytic symptoms in left hand and foot. Subsequent L. hemiplegia (imperfect).

Death 4 years after failure of V. Granular kidneys, but no disease detected in brain.

The improvement of V. and loss of the paralytic symptoms in hand and foot occurred while taking iodide and mercury.

Case 84. G. 25. Chas. W., 40.

Gradual failure of both, but R. several months before L. Nearly complete blindness in about 18 months.

Admitted 9 months after V. had become stationary ($2\frac{1}{4}$ years after failure began). V. then = bare p.l.

R. then advanced atrophy; central artery of good size.

L. still partially obscured by lymph, which must have been present about 2 years.

Ps. motionless and partly dilated.

Four years later wrote that he was quite blind.

Subject to rheumatism (relapsing form) in various joints.

Syphilis possible about 15 years ago, but not proved.

Case 85. F. 85. Mrs. Y., 33.

Failure of L. 1 year.

„ R. 2—3 months.

Neuritis passing into atrophy in each; more advanced in L. Remains of lymph in both. Arteries considerably diminished. A month after admission V. worse: = shadows. Ps. somewhat dilated.

Failure of each eye preceded and accompanied by pain in back and in head, and sickness. Recovery of good health for several months between the failure of the two eyes.

After second eye failed, some pain, numbness, and weakness of limbs; speech hesitating; loss of memory. L. arm worse than R. Subsequently fits. Final state not known.

Perhaps syphilis $3\frac{1}{2}$ years ago ($2\frac{1}{2}$ years before symptoms began).

Case 86. B. 385. Geo. L., 25. (Probably published O. H. R., vol. v, p. 168.)

Typical neuritis in each eye, with woolly, grey, elevated discs. Gradual failure of sight 9 months, but without any symptoms of disturbed health, except latterly nervousness attributed to over-smoking; none of the usual symptoms which accompany neuritis. V. 12 Sn. barely.

Latterly excessive nocturnal emissions. General health good.

Disagreement of mercury (made him feel weak but did no good); ophthalmoscopic appearances and symptoms quite stationary for 8 months.

Case 87. C. 354 and 338. John R., 28.

Double neuro-retinitis with much lymph on discs, and many extravasations and some white deposits in retina. Ps. equal. V. very defective.

No albuminuria (tested several times). Some defect of R. external rectus.

No history of syphilis.

Great improvement of V. under iodide of potassium.

Case 88. B. 216. Bernard T., 40. (July, 1864.)

A case of typical neuritis with swollen woolly disc, and numerous hæmorrhages into the retina near the disc, in one eye (L.); and in the other (R.) atrophy of the *y.s.* side of the disc with considerable diminution of all the retinal arteries, probably following neuritis.

Extreme defect of sight (barely fingers) in the atrophic eye ; good vision (8 J.) with the neuro-retinitis eye.

Failure of the atrophic eye stated to have come on suddenly 2 weeks before I saw him. He was at the time ill in the London Hosp. with pain in the head, and had had this symptom for 2 months. He attributed his headache to getting wet and catching cold.

No note of progress.

Case 89. C. 288. Henry F., 14.

Recovery of nearly perfect sight, with pale discs but central vessels not diminished, after acute double neuritis (swollen woolly discs) with total blindness for 1 week.

Ps. large and almost fixed.

Failure preceded and accompanied by headache, loss of appetite and sickness. He recovered under mercurial treatment.

Illness occurred at end of May, in hot weather (1868).

Heard of in 1875 (æt. 21), and then V. remained so good that he had enlisted in army.

Case 90. C. 86. Bridget W., 21.

Double optic neuritis and amaurosis. Failure of V. coming on suddenly in association with weakness of R. arm and leg, and preceded by giddiness and headache.

The weakness of arm and leg remained for (probably) several months.

(Symptoms (loss of V.) began at Christmas. She was admitted Dec. 31, but probably 12 months (not 1 week) after the failure. No later note. Dates incomplete.)

Case 91. G. 47. Wm. B., 58.

Double optic neuritis, more advanced in R., and with hæmorrhage in that eye. Liable to gout for many years. No albuminuria.

Four years later he wrote that he was quite blind and in feeble health.

Case 92. G. 31. Chas. W., 32.

Failure of both alike in about 6 months to absolute blindness. Ps. moderately dilated but fairly active. V. bare. pl. Subsequently no p.l.

On admission, 6 months from beginning of failure; well marked woolly neuritis of R.; beginning to clear off on *y. s.* side. L. less lymph, more atrophy. Arteries much diminished in both.

Slight pains in head during the failure, but no other symptoms. Nervous manner; speaks very deliberately, and occasionally sighs.

Mother died insane at 50, had been so for some years.

Father living, *æt.* 103.

No syphilis. Married and 4 children.

Case 93. B. 224. Mrs. M.

Paralysis of R. third and fourth nerves, and atrophy of R. disc; former temporary paresis of R. arm.

No syphilis known, but severe pain in head.

Case 94. G. 43. Frances C., 13.

Atrophy of discs more advanced in R., and with considerable diminution of vessels in that eye. No choroiditis.

Failure of V. said to be of only 4—5 months' duration.

Patient the subject of strongly-marked hereditary syphilis.

Elder brother has abundant choroiditis.

Case 95. G. 227. James D., 40.

Atrophy of discs and diminution of arteries, probably after neuritis, and with V. much worse in one than the other.

Horizontal hemiopia in one eye.

Failure began 4 years ago, and soon became stationary in R., but went gradually to shadows in L.

Ill for several months previously, with great thirst, bad appetite, weakness, and increasing corpulencé. Diabetes suspected, but not confirmed (Dr. Pavy).

The symptoms began 10 months after his second marriage.

Syphilis possible, but not evidenced. No lead poisoning. No other nerve symptoms.

Case 96. C. 63. Geo. D., 19.

20 months ago, pain in R. face and head, followed by an abscess at outer corner of R. eye. Rapid failure of R. eye a few days after abscess burst. Now sees shadows. O.D. grey-white; veins beaded. Arteries diminished; some haze on O.D. (Old neuritis.)

Deep hollow beneath extr. angular process. Eyeball somewhat prominent.

5 months ago, pain in L. temple for 3 weeks; then rapid failure of L. to blindness in 5 days. Now no p. l. O.D. just as in R. There is now an abscess in L. temporal region, and enlarged cervical glands.

A very peculiar case.

Case 97. Neuritis probable. ? Syphilis. ? Sunstroke.

F. 43. Robert Haywood, 34.

Rather sudden failure, progressing for 3 months, a year ago, without any other symptoms.

Atrophy of discs, with evidence of former neuritis, but vessels not much altered.

Ps. rather large and R. oval. V. fingers.

Soldier; has been to West Coast of Africa for several years, but had no fever.

No note as to syphilis.

Six months later, no better.

Case 98. M. C. T., Case 19, B. 230. Wm. R., 45.

Amaurosis with atrophy, slowly progressing to all but absolute blindness in 2—3 years. R. eye preceding L. by 6 months. Failure of R., preceded by violent earache, with giddiness and great sleepiness.

Ps. equal, too small, and quite motionless, but dilated well to atrop. O.Ds. dirty gray; vessels not materially altered.

Health and strength good.

Case 99. G. 234 and O. H. R., viii, iii, 499. Mrs. J., 35.

Neuro-retinitis with hæmorrhages in one eye of a woman who had disease of liver and piles.

Case 100. G. 238. Mrs. S., 30.

Failure of L. suddenly the morning after she had got very wet; was menstruating at the time, but it was not checked.

Neuro-retinitis with hæmorrhages near O.D., and haze about y.s.

V. 16 J. about 5 days after the failure.

V. same 3 years later, and other eye not affected.

Case 101. Choroido-Neuritis, with Hæmorrhage in Typhus Fever.

B. 188. John B., 50. (1864.)

Complete atrophy of one disc, with extreme diminution of all retinal vessels; numerous large recent blood extravasations in choroid, and small ones on disc. Sight extremely defective, and soon going on to no perception of light.

These changes confined to one eye, and coming on during the delirium of a fever (? typhus); was delirious 2 weeks, and in the Fever Hospital 7 weeks.

The other eye had been cataractous for 13 years; he had good perception of light with it, and after removal of the (fluid) lens, he was able to read large print with suitable glass.

Case 102. C. 289. Wm. C., 53.

Gray atrophy of discs and diminished retinal vessels, with some small hæmorrhages at periphery, and much damaged V., after albuminuric retinitis.

Myopia, and in R. a large staphyloma.

Case 103. F. 37. O. H. R., VII, 480. Mrs. N., 37.

Retinal hæmorrhages, and disease of vitreous, with, later on, doubtful detachment of retina, in L.

Atrophy of disc, probably the result of similar retinitis, in R. She suffers from gout (inherited).

Case 104. Results of Albuminuric Retinitis?

F. 295. Fredk. B., 39.

Atrophy of discs, and some choroido-retinal changes, probably secondary to hæmorrhages, with much diminished retinal vessels. All but total blindness.

History of gradual failure, without other symptoms, while at sea in India, æt. 37; formerly much subject to nose-bleeding.

History of several attacks of ? cerebral symptoms at intervals during the preceding 4 years; in one of them severe nocturnal headaches.

Probably had syphilis at about æt. 29.

Case 105. B. 336. James S., 56, painter.

"Neuritis and apoplectic effusions" probably in R. eye only, and of only a few days' duration.

Ilad had violent toothache on R. side, with pain in R. forehead, for a fortnight before, and had "a week of dreadful pain in the eye and side of face" after his first attendance.

The failure of sight was attributed to "a sort of sun-stroke" which occurred just before the sight failed, while he was painting close to the copper roof of a verandah at temp. of 92° F.

Case 106. L.H.R. I, 50, and B. 47. Case 21. Jas. S., 31.

Gradual failure of L., and rather sudden failure of R., a year or two before admission. Variations in sight.

July, 1862. V. barely 16 J. with + lens.

Ps. equal and normal size, but sluggish. O.Ds. too red?

August. O.Ds. somewhat pale, especially L.; yet V. best with L.

June, 1864. V. as before, no worse; liable to temporary attacks of increased dimness. Ps. large and sluggish. Small but definite patch of diseased choroid at each *y.s.* O.Ds. gray-white. Central artery in each small.

It was at first thought to be a tobacco case.

He denied all V.D., and there was no history of any symptoms. Was very drowsy, but formerly had not been so.

Case 107. F. 201. Mrs. A., 37.

Severe neuralgic headaches, 6—7 weeks. Failure of V. 4 weeks.

Slight neuritis with some white lymph on discs, and a doubtful hæmorrhage.

Discs pale, especially L. Defect very slight; V. = $\frac{20}{20}$ and 2 J.

No syphilis.

Subject to chronic rheumatism in joints.

Case 108. F. 265. Mrs. S., 45.

Neuritis, ending in partial atrophy, with very little defect of V. in a woman for years subject to nervous headaches and latterly hemicrania.

History of partial paraplegia some years ago.

Subjective tastes and smells.

Syphilis unproved, but not improbable.

GROUP VIII.—PROGRESSIVE AMAUROSIS, WITH ATROPHY OF DISCS.

A. *Atrophy of Discs and Amaurosis as a part of the Changes occurring in various forms of Insanity.*

In some the amaurosis preceded, while in others it followed the appearance of other symptoms.

Some of the patients became permanently insane, and died in that condition. One (Case 113) recovered after temporary insanity, but with atrophied discs; in this case and in another (Case 27) perhaps nearly allied to it, the failure was gradual, and in neither was there any proof of syphilis; in neither was there much evidence that intraocular neuritis ever occurred; in both it may be surmised that some structural changes took place during a limited time, and probably syphilis, although not admitted, was the most likely cause.

Case 109. M. C. T. Case 53. B. 196. John R. P., 51. (1864). Has been a clerk in City house 20 years.

Gradual amaurosis, with gray-white atrophy, without much alteration of vessels. Pallor greatest on *y. s.* sides. No other disease of fundus.

1861, æt. 48. Took a business for self. Increased anxiety.

1863, April, æt. 50. Several times slight giddiness. Loss of flesh, pallor, great weakness. V. began to fail. No other nerve symptoms.

1864, May. First seen.

1865, December. V. worse. Cannot see large objects, and yet has photophobia. Ps. motionless and slightly too large. Health good.

1867, May. Became patient at Bethnal House Asylum.

1869, March. Died there. Never regained his sight.

Case 110. B. 191. James G., 56.

Amaurosis coming on gradually during some months to almost total blindness. Partial atrophy of discs, like tobacco blindness, but with some diminution of arteries, after an attack of insanity, &c. A very intelligent man.

1864, æt. 46. Gradual imperfect paraplegia, permanent; worse in L. leg.

Æt. 51. After business troubles, insomnolence for weeks, followed by mania. 3 years in Hanwell Asylum. Severe pain in head at beginning of illness.

Æt. 56. Failure of sight. Drowsiness. Partial anæsthesia of fingers.

A year or two later was in Colney Hatch, and had been there 16 months. Paraplegic, violent, almost blind.

No note as to syphilis.

Case 111. L. H. R., I. 40, Case 4. (A. 2, 94, and B. 56). Charles N., 45.

Absolute blindness and atrophy of discs in a man who had been threatened with general paralysis and with insanity.

Case 112. G. 258. George B., 40.

Rather rapid onset of failure the day after going to Brighton on August Bank holiday.

9 months later, slight atrophy of discs. V., R. 19 J., L. 14 J.

2 years after failure, somewhat more advanced atrophy. V., shadows.

Failure preceded by nervousness and weakness, but no definite illness. Failure of memory. Later on great diminution of sexual power. Much indigestion for years. No other signs of nervous disease.

A very moderate smoker, and continued it more or less for about 9 months after failure began.

Probably not a tobacco case.

? General paralysis coming on.

Case 113. G. 106. and L. H. B. 11. Philip B., short, stout, very muscular.

Æt. 31½. V. began to fail very slowly. Had for some months before had giddiness and headache. Smoking ½ oz. a day.

Æt. 33. V. shadows. Blue-white atrophy of O.Ds. and some diminution of arteries. Ps. moderately dilated and sluggish; acted well to atropine. Sycosis of face.

Left off smoking for several months, but then resumed.

Æt. 33½. Went to Margate. Bathing depressed him extremely, and took away appetite. Symptoms of insanity began.

Æt. 35—36. Insane for 17 weeks. Violent a part of the time.

Æt. 43. Has remained well except occasional shoots of pain in the head. Ps. medium, insensible to light. O.Ds. same as before. vessels considerably diminished. No evidence of past neuritis.

No history of syphilis, but risk admitted. A brother had epilepsy.

Case 114. G. 394. John W., 44.

Atrophy of discs and amaurosis. Failure of V. 18 months.

The pallor of discs uniform, not like a tobacco case.

Formerly a great smoker, but for 6 months past only 1 oz. a week, and milder tobacco.

Very intemperate (claret); tremulous; cannot eat.

Died 2 months after notes were taken. "Epilepsy and Congestion of the brain of 10 days' duration."

Case 116. O. H. R., V. 227, B. 246. Elizabeth C., 16.

Failure of V. at æt. 10 or 11, gradually going to only p. l. at time of admission.

Idiocy and liability to fits from infancy. Atrophy of discs without diminution of vessels.

History of fits and other nervous disorders in maternal relatives, but not in mother herself.

Case 117. B. 237. Charles C., 24.

Atrophy of discs and partial amaurosis, after fits, headache and despondency. "Brain-fever" 2 years before the failure of V. Subsequently more fits and cerebral symptoms.

Father died insane.

Case 118. F. 405. Elizabeth B., 25.

Atrophy of discs. V. never good, but has got worse lately.

History of fits at about æt. 12 and since.

V. now very defective.

Mother insane, and reported to have very bad sight, and to have been formerly very intemperate.

B. *With Disease of Spinal Cord.*

1. Cases illustrating the amaurosis occurring in locomotor ataxy.

2. A group of cases of progressive amaurosis, ending in atrophy of discs, with symptoms of disease of the spinal cord, but not locomotor ataxy. The amaurosis is sometimes quite symmetrical from the outset; in other cases one eye precedes the other. The pupils are motionless to light; often too small, and never materially dilated. They are often of unequal size.

Failure of sexual power is noted as a marked symptom in almost all.

Some of these cases are, at first, difficult to distinguish from the amaurosis caused by tobacco.

Case 119. Wm. B., 38.

Atrophy of discs much more advanced in R.

V. R. bare p.l.

V. L. nearly perfect.

Locomotor ataxy beginning in R. leg 7 years ago; then L. leg and back, and then numbness of fingers. Then 4 years of ptosis of R. and diplopia, followed by failure of V. about 4 months ago.

Impotence following a period of great sexual excitement at the beginning of his complaint.

Ps. motionless; L. the larger.

Case 120. C. 308, O. H. R., VI, 283. Joseph P., 57.

Amaurosis (nearly complete) and atrophy of discs; coming on in about 6 months.

Several years later, signs of locomotor ataxy; and xanthelasma palpebrarum.

Several years before failure of V., almost universal alopecia came on; it was permanent.

Had never smoked.

Case 121. G. 130. Thos. W., 45.

Locomotive engine driver.

Locomotor ataxy of about 5 years' duration.

Now partial atrophy of discs (*y s.* side); L. much more than R., but without impairment of V. ($\frac{2}{2} 0$ and 1 J. with each eye).

Dilatation of R. pupil and weakness of accommodation for 5 years, but attributed to a severe blow on the eye.

Case 122. B. 235. M. C. T., Case 17. Thos. K., 50.

Probably locomotor ataxy.

Failure of V. about 10 months.

Atrophy of discs.

Numbness and weakness of lower limbs, and subsequent imperfect co-ordination.

Loss of smell.

Failure attributed to attack of delirium tremens.

Case 123. Bag and Day Book, 24th Jany., 1875. Wm. H.

Spare, healthy-looking coachman.

Rapid failure of V. with atrophy of discs, imperfectly symmetrical. Ps. absolutely motionless; slightly larger than natural, and L. rather larger than R.

Failure of sexual function, without previous excess; aching in back; stabbing pains in legs, and some weakness or feeling of weakness, and yet no inability to walk long distances. No inco-ordination; slight incontinence of urine.

Case 124. Bag. Wm. H., 50.

Failure of V. gradually in several months, symmetrically, down to 18 J.; began rather suddenly.

Numbness in fingers lately; occipital headache and tightness across bridge of nose, and definite failure of sexual power for a year past.

Was always liable to cold feet. Married at æt. 22, and always had good health.

The amaurosis, accompanied by clouds of black muscæ, "like rooks;" never formerly subject to muscæ.

Ophth.: notes incomplete, but probably discs more or less atrophied.

Case 125. C. 195. Jas. R., 41.

Progressive failure of V. more rapid in L. than R.; atrophy of O.Ds., also more advanced in L.; paresis of L. 3rd nerve, and subsequently weakness of legs.

Probably disease of cord, or motor tract in brain. No evidence of syphilis.

Case 126. G. 274. Geo. W., 50.

Gradual failure of V. 8 in about 12 months to no p.l. with R., and fingers with L.

Advanced atrophy of discs; *lam. cribrosa* exposed in R., but still obscured by slight opaque whiteness of disc substance in L. (slight neuritis).

Shortly before failure of V. began, he lost all sexual power, and lately has had some retention of urine. No unusual constipation.

Appears in good health, but a great spirit-drinker and large smoker (rum and shag).

While under care, he diminished his rum a good deal, but was still drinking $\frac{1}{2}$ pint a day.

Case 127. F. 226. Mr. B. (railway goods' manager). "Already published."

Absolute amaurosis, with gray-white atrophy of discs, without much diminution of vessels.

Myosis, and partial resistance to atropine.

Subsequent partial paralysis of limbs.

(Note in February, 1871).

(Also under Dr. Jackson's care in 1871).

Case 128. C. 343. K.

Atrophy of discs, more advanced in L., without evidence of neuritis.

Numbness of feet and cold sensation in back.

Ps. motionless, not much dilated, but L. larger than R.

Several years after first note, "still smokes freely."

Notes extending over several years (1864 and 1868), but there are probably earlier ones; possibly already published as tobacco.

Case 129. C. 275. Mrs. M. C., 39.

Complete blindness (no p. l.) with blue-white atrophy of discs and much diminished vessels; slight haze of discs, but no positive evidence of neuritis.

Æt. 27. Overworked and anxious. Failure of memory, and sudden attack of cerebral symptoms, followed by partial dementia with paresis of R. side; and 6 weeks later nearly complete loss of V. Recovery of good health and partial recovery of V., lasting 12 years, but history of variations of V.

Æt. 39 (6 months before admission). V. again failed to complete blindness. Much severe aching and shooting pain in head.

Married since the first illness, and has had one child.

Case 130. ? Spinal Disease.

B. 239. George C., 49.

Rapid failure of sight, with atrophy of discs and diminution of retinal arteries and veins, more advanced in left. L. p. dilated and fixed. Slight divergence of eyes with diplopia in early stage.

Progressing to absolute blindness in about 6 months, and then attended by numbness and pins-and-needles in hands and feet, sometimes accompanied by a fleeting rash of red, hard, painful patches on calves of legs and fronts of arms.

About $1\frac{1}{2}$ year after sight failed, "a weight and numbness about the abdomen."

History of several severe blows on head within 20 years. One 6 mos. before eyes failed; another slight blow by a glancing nail on L. cheek near eye, 1 week before failure.

No somnolence. A smoker.

Under care December, 1864 to May, 1866.

C. *Amaurosis in Young Men without assignable cause;
Hereditary Atrophy; Progressive Atrophy in Women.*

This is a small group, the cases being very infrequent. It is, however, of great interest, and the more detailed study of similar cases may throw light on the causation of other forms of progressive atrophy and of disease of the nervous system.

The failure in most of these cases in young men is rapid. When seen tolerably early, there is sometimes marked evidence of neuritis. With regard to other symptoms, we find many variations. In some the patients have had headaches and cold feet; some have been exposed to great sun heat; some are smokers and drinkers; others have never smoked. In one there was a family history of insanity. The state of the pupils varies a good deal. In some there is evidence of central scotoma. I am not acquainted with any cases in young women resembling these.

Perhaps if the family histories had been more complete, some of the cases would have been found to belong to the

well known and very peculiar group in which progressive atrophy of the discs occurs in several members of the same family, some of them being young men and some being women. I believe that no other symptoms of disease of the nervous system accompany this form of amaurosis, and that it seldom progresses to complete blindness. In progress, result, and in the absence of other conspicuous symptoms, these cases closely resemble those of tobacco amaurosis.

Closely allied to the cases in these two groups is a third very small group, in which women are the subjects of slowly progressive amaurosis, with atrophy of discs, without other discoverable disease.

Case 131. B. 133. L. H. R. I., 58, Case 42. John B., 18.

Amaurosis, with only slight pallor (yellow) of discs, coming on quickly while in prison in July. Seen 2 months later at Moorfields, and could then just see 20 J. with R., and not so much with L.

Had had neither tobacco nor alcohol during his 15 months' stay in prison, but had good diet and was in fair health.

Slight feverishness for a few days before failure.

Case 132. G. 263 and O. H. R., VIII, Case 43. Henry F., 21.

Failure suddenly while exposed to tropical sun at sea; a heavy smoker and drinker.

Atrophy of discs, uniform, with diminution of arteries, and slight patch of opacity on one disc; said to have had neuritis by an earlier observer.

V. better at night than by day (probably due to central scotoma).

Some improvement of V. while still smoking. There had been no other symptoms of nerve disease.

Tobacco very doubtful as the cause.

Case 133. John W., 23.

Gradual failure during about 3 months down to 20 J. with L., and shadows with R. Discs atrophied and opaque, with remains of lymph on them. Ps. ordinary size; R. very sluggish, L. active.

Failure beginning while at work in harvest-field in August,

but no history of sunstroke. He did not work bareheaded in the sun.

During failure his feet were very cold at night (a new thing to him), and afterwards he had some severe headache extending from forehead to occiput.

A small smoker. No syphilis. No masturbation. No lead poisoning. Health appears good.

Case 134. C. 200. Wm. W., 20.

Failed 3 months ago, rapidly; he believes in a single night it failed to its present degree = $\frac{20}{0}$ and 16 J. at 4'', but evidence of this rather imperfect.

Discs pale and slightly hazy, and the arteries considerably diminished, and some evidence of choroidal changes near O.D.

Ps. large and sluggish.

A smoker. The failure occurred in March. He attributed it to worry from having a cart and horse stolen. No note as to syphilis.

Case 135. C. 181. Wm. S., 18.

Failure of V. in a fortnight down to $\frac{20}{0}$ and 10 J. at 5'', preceded by headache, but no sickness.

At a fortnight after it began O.Ds. considerably congested, and very slightly hazy; retinal veins very much engorged, without being very tortuous.

Ps. rather dilated and very sluggish; dilated more when covered.

Hy. $\frac{1}{24}$ after atrop., but no improvement.

Under care $2\frac{1}{2}$ months, and remained the same, the defect being most marked at centre of field.

Subsequently wrote to say that his V. gradually improved, and 7 years after the failure there was "not much the matter."

A very unusual case.

Tobacco not noted.? Masturbation.

Case 136. Rapid Failure to Total Blindness in a few weeks. Extreme Atrophy of Discs and great diminution of Vessels.

B. 200. M. C. T. Case 22. W. McC., 21.

1863 (spring), æt. 19—20. In good health; smoking and drinking freely. Unmarried.

April. Leaves off smoking entirely.

May. Becomes a total abstainer.

October (early part). V. begins to fail.

„ 25th. Marries.

„ 28th. Has to leave off work because V. has become so bad.

November. Treated at Hull by counter-irritation and mercury to salivation.

1864, June, æt. 21. Has been blind for 6 months (no p.l.)

Other nerves perfect.

Health good.

While V. was failing, had photopsiæ and once had two curious attacks of spasm of lower extremities.

Case 137. G. 95. Alfred Haynes C., 27.

Gradual failure of both eyes together at æt. 21; down to shadows, in about 6 months.

Atrophy of discs, probably (from appearances) after neuritis, without much diminution of vessels. V. best by dull light.

A slight smoker throughout.

Liable to considerable headaches.

History of insanity and other nervous diseases, in several predecessors, on father's side, male and female.

History of gout and occupation of painter in several of father's side. Patient, a painter, but no symptoms of lead-poisoning.

No evidence of syphilis, but risk often.

Case 138. C. 65. M. C. T. Case 5. Benjamin P., 15.

[R. defective for long; not sure when it failed, or whether it was ever good.]

Gradual failure of both 5 years ago, without other symptoms.

L. = puzzles out 20 J.

R. = quite blind.

Discs white, especially on *y.s.* sides; vessels not materially diminished.

They failed in 6 months to their present condition.

Ps. small and dilate very little with atropine.

Never smoked till after V. began to fail.

Probably defective virility.

Case 139. C. 122. Jas. A., 16.

Myopia from childhood. Gradual failure of V. since he went to sea, about 2 years ago. Has been in hot climates.

O.Ds. pale and slightly hazy, and arteries very much diminished. Veins less diminished in proportion than arteries.

Ps. large.

Appearances "exceedingly suspicious of past neuritis."

Not a smoker. No syphilis.

No illness of any kind.

Hereditary Amaurosis.

Case 140. M. C. T., Case 24, and B. 184, and C. 314. Jas. G., and Mrs. G., his mother.

Slowly progressive amaurosis, with white atrophy in a woman at the climacteric period, going on to nearly complete blindness. History of very severe headaches and morning sickness.

A son the subject of similar conditions, and a nephew said to have the same symptoms, both being smokers.

D. Unexplained Progressive Atrophy in Adults of both Sexes.

(Some probably due to Syphilitic growths pressing on Optic Tracts or Centres.)

Case 141. F. 21. Mrs. F., 37.

Progressive failure to total blindness in about 6 months, with atrophy of nerves, and no certain evidence of neuritis.

R. failing before L.

Deafness.

Severe pain in head, especially forehead, for several months before the failure began.

Syphilis 6 years ago.

Case 142. F. 128. Mrs. H., 40.

Failure of V. in about 6 months down to p. l. Partial atrophy of discs, more on y. s. sides.

For a year or more before failure began, liable to attacks of pain in head, and to fits of unconsciousness without convulsion. 2 weeks before failure unusually severe headache. with vomiting, and accompanied by deafness of L. ear. Headache sudden and intense.

Always liable to bad sick-headaches.

Very probably syphilis by conception, but not proved.

Case 143. B. 82 and L. H. R., i, 56, Case 36. Mrs C., 46, a widow.

Failure of V. rather quickly, about 1 year before admission, the L. being the worse. At and since this time she was intolerably sleepy. For a long time before failure began was very sleepless, having originally been a fair sleeper. No headache, a little giddiness. Occasionally had double V. at long distances.

Good health, liable to flush much.

V. 20 J. barely, better with R. Discs moderately white, L. the more so; arteries somewhat diminished.

Ps. large, equal, very sluggish.

Case 144. Mrs. W., 49, actress.

A very peculiar form of neuritis and consecutive atrophy; discs greenish-white and waxy, the *y.s.* sides absolutely devoid of vessels, the remainder hazy as if from green-tinted wax.

Central vessels not materially altered.

Ps. small.

L. failing 6 years; R., 3 years; V. = bare p.l.

Has had good health and no head symptoms, but is feeble.

No lead poisoning.

Case 145. G. 89. Maria S. P., 52.

Gradual failure of V., 5 years; much more quickly, 12 months.

Slight neuro-retinitis (haze).

V. not noted.

5 years ago sudden partial R. hemiplegia, recovering in a year; 1 year ago, history of a fit (? epileptic, but said to have been a "sunstroke").

Failure of memory.

No reason to suspect syphilis, acquired or inherited.

History of excessive "nervousness" in childhood, "so nervous, it was thought she would not live."

Case 146. F. 358. Mrs. B., 55.

Failure of V. 2 years, gradual. Headache and sickness often.

When admitted, atrophy of discs with remains of neuritis in one. V. R. shadows; L. 20 J. barely. Arteries diminished.

3½ years later she wrote that R. had improved, but L. had become entirely blind; the R. having formerly been the worse.

She took iodide for some months.

No proof of syphilis.

No note as to urine.

Case 147. F. 396. Anne S., single, 46.

Neuritis passing into atrophy of both, with almost total blindness.

Gradual symmetrical failure of V. for 12 months.

Always subject to sick headaches with vomiting, and they have been rather worse lately.

Suffers from chronic joint rheumatism.

History of an illness ("low fever"), attributed to anxiety, æt. 30.

No reason to suspect syphilis.

Case 148. C. 294. Mrs. H., 56.

Atrophy of discs and extremely defective V., worse in L. Gradual failure about 1 year, with pain in L. side of nose and at inner canthus.

Ps. fixed, R. rather larger than L. T.n.

Long continued arsenical poisoning from artificial flowers.

Case 149. O. H. R., V. 315. C. 10. Anne R., 40.

Advanced atrophy of O.Ds., more in L. than R. Vessels of fair size. With R. can see largest print.

Both failed in childhood after fits, and a fall downstairs on the head.

All her life subject to headaches, with sickness, and to much dyspepsia.

Seen again æt. 46, and had then commencing xanthelasma on each upper lid.

In the L. there were patches of atrophied choroid.

Is said to have had water on brain.

No note as to hereditary syphilis.

Case 150. C. 41. Mrs. R., 60.

Intense pain in eyes and head, especially top and back, with failure of V. in both, and impaired movements of the eyes.

In 3 months (June, 1866), V. = just counts fingers. Ps. active and n. size. No increase of T. Retinal veins turgid and discs congested.

No other changes.

February, 1868. V. improved, and with + 10 she reads small print; improvement gradual. Still much pain in head, but not much in eyes. Health much improved. O.Ds. n.

Took very small doses of iodide for a year and a half.

No note as to syphilis.

Case 151. B. 144. Eliza H., 29.

Amaurosis coming on rapidly, and going on to complete extinction of sight in one night in L., and in 5 days in R., with severe headache, proptosis, ptosis, and limited movement of eyes.

All the symptoms occurring at menstrual date, the flow being absent, and having previously been regular.

Great sleepiness.

Gradually increasing headaches for several weeks before.

Ps. moderately large; very sluggish.

Retinal arteries rather small, and retinæ? slightly hazy.

Case 152. Amaurosis in a Woman resembling Tobacco Amaurosis.

M. C. Trans., 1867, Case 2. Mary Anne H., 52.

Gradual failure of both eyes during 2 years, down to bare p. l. The R. was, she says, at first the worse.

Blue-white discs; arterics somewhat diminished.

No cause assigned. Not a smoker. Health good.

Case 153. Symmetrical slow Amaurosis in a Woman.

O. H. R., v, 168 (and B. 168). Mrs. S., 51.

Failure of both gradually during 4—5 months down to V. = shadows with L. and = 20 J. badly with R.; and $\frac{20}{50}$.

Yellowish pallor of discs, general in L., more on y. s. side in R. Slight doubtful diminution of arterics.

Failure attributed to distress at death of child a year ago (about 6 months before failure of V. began).

Death after sudden pain in head, followed immediately by 12 hours' unconsciousness, 4 months after coming under care, and 8—9 months after failure of V. began. No p. m.

Case 154. B. 206. Rebecca W., 66.

Gradual failure of both, but L. most rapidly, 5 years ago; rapid increase of failure, 4 years; since then L. quite blind; R. varying, occasionally better, especially after sleep, but usually nearly blind.

O.Ds. very white; arteries and veins diminished.

Pupils rather small, nearly motionless, dilate imperfectly to repeated applications of atropine.

Much anxiety and sleeplessness before V. failed, but no other cerebral symptoms.

Case 155. M. C. T. B. 248. Case 1. Eliza N., 29.

Slowly progressive failure of V. to all but complete blindness in about 10 months, with bad headaches, muscæ, and photopsiæ.

Disks pale at first, and becoming very white, with much diminished vessels after a few months.

Case 156. C. 360. Sarah J.

Atrophy of disks, going on to complete blindness at about æt. 27.

L. failed before R.

No evidence of neuritis; disks clear gray-white, and vessels not diminished, when seen 4 years and again 9 years after failure.

Ps. retained activity, but acted irregularly.

Failure accompanied for a time by violent headache, but no sickness.

Photopsiæ and white mists still complained of years after she had lost all p. l.

Failure began at about time she was under care for uterine displacement. Has never menstruated.

Case 157. L. H. R., i, 54 (and B. 94). Case 33. Wm. H., 54. Intemperate and a smoker.

Gradual failure of both for a year. On admission R. rather the better (20 J.), but its pupil considerably larger than L. Both ps. very sluggish.

Atrophy of disks, with great diminution of all the central vessels.

Case 158. O. H. R., ix, 125, and B. 55. John C.

Symmetrical amaurosis with white atrophy. Gradual failure during 3—4 years, beginning 8 years after severe blow on face. The blow followed very soon by permanent paralysis of R. external rectus.

Condition 13 years after admission, and 17 years after failure began, "totally blind."

Case 159. B. 13. Richard H., 42. 1861 or 1862. Probably published.

Failure of sight 3 months.

Dimness the only symptom.

Cannot now see hands on clock face. Formerly perfect sight.

12 years ago depressed fracture of L. parietal bone; nervous ever since.

2 years ago lost his property, and took to drinking.

9 months ago became very heavy for sleep, but this has passed off.

Now restless and nervous.

Discs yellow-white; vessels not diminished.

Ps. ordinary size.

Case 160. F. 303. Jas. H., 45, gardener.

Gradual failure, with delayed symmetry, going on to all but blindness in both, in about 6—8 months.

Discs atrophied, more advanced in the R., which failed first.

Vessels considerably diminished in the worse eye.

Ps. inactive.

A slight smoker; left it off entirely, but continued to get worse.

No other symptoms whatever, except later on some deafness of R. ear, with aching pain.

Drinks very moderately.

Doubtful syphilis many years ago.

? Spinal disease.

Case 161. F. 51. Henry T., 45.

Gradual failure of both, with photopsiæ, 18 months or 2 years.

Some frontal headache during the last 3 weeks.

Advanced atrophy of discs, dirty greyish. Slight changes, as if from past neuritis, at circumference of discs.

Has not smoked for 20 years.

Case 162. G. 122. Wm. C., 43, from Dr. Eady.

Gradual failure 9 weeks. Partial atrophy of discs, with haze of retina for considerable distance around.

Gradual continuance of failure to almost blindness in about 7—8 months from commencement.

Retinal arteries somewhat diminished.

Syphilis possible some years ago, but not proved.

A very small smoker.

No evidence of lead poisoning.

Case 163. G. 123. Jessie B., 47.

Rapid failure in 3—4 days down to 20 J. with R., and 14 J. with L.

Pallor of discs, and slight haze of retinae for some distance around; vessels considerably diminished in R., not diminished in L.

Probably had syphilis several years ago, but no evidence of it now present.

His evidence as to rate of failure not very trustworthy.

Case 164. Bag. H., 26, a farm labourer (1863).

Amaurosis with white atrophy, more advanced in L. Failure 10 months.

No cerebral or spinal symptoms.

A very small smoker.

Case 165. Book "Amaurosis," p. 56. John G., 50.

Blindness from white atrophy of discs, with great diminution of retinal arteries, but not of veins.

Failure began 10 years ago; was complete in a year.

Was very sleepy; had headache, and still has it.

Never smoked.

Case 166. Book "Amaurosis," p. 20. Samuel D., 62. No date. Probably 1862.

Slowly progressive failure of sight, without any accompanying symptoms.

Previous giddiness and pain in head on looking upwards, for about 3 years.

Indigestion many years.

Health good.

No mention of tobacco.

No ophth. exam.

Case 167. Book "Amaurosis," p. 17. James S., 45. April, 1862.

Atrophy of discs and great diminution of retinal *arteries* (not of veins), with all but complete blindness (bare percept. light) coming on in 2 years.

Failure began soon after prolonged anxiety and hard work (wife's illness and death).

Tobacco not mentioned.

Case 168. C. 82. M. C. T., Case 4. Wm. Y., 47.

Gradual failure of both to complete blindness in 9 weeks, with severe pain in temples coming on after failure began.

Remained quite blind for more than 2 years, and on admission (2½ years after failure began) he could see shadows.

A smoker, but left it off 6 months after failure began because it made him nervous. (Note, however, that he was then blind, and probably, therefore, not living so well as usual).

No evidence of constitutional syphilis.

Gray atrophy of discs with considerable diminution of arteries. L. paler than R. No other disease. Ps. rather large and almost motionless.

*Case 169. Probably neuritis and paralysis of R. external rectus.
? After sunstroke.*

C. 178. William P., 52, a sailor.

Atrophy of discs and considerable diminution of arteries.

L. no p. l.

R. sees large objects.

Ps. normal size and almost motionless.

Convergent strabismus of R. (State of R. external rect. not noted).

V. failed 10 years ago in the tropics, but failure has been gradual. At first he had diplopia, when R. began to turn in; is sure he did not squint before.

Good health.

Could never learn to smoke; tried when very young and gave it up.

Case 170. F. 218. Thos. B., 34.

Amaurosis with slight doubtful neuro-retinitis more marked in R.

V. $\frac{20}{200}$ and 20 J.

Preceded by very severe headache entirely preventing sleep.

History, and present evidence, of old compound fracture of skull from a fall at æt. 5 years on to a broken bottle.

Not a smoker.

No note as to syphilis.

Case 171. Progressive Atrophy in Tertiary Syphilis.

G. 19, and M. F., 261. Daniel S.

Under care Metrop. Free Hosp. in 1857 (*æt. about 38*) for rash on arm, probably syphilitic.

Æt. 45, began to suffer from severe headaches (vertex), coming on every few days and keeping him awake at night.

Æt. 46 (about). V. began to fail, and has slowly got worse.

Æt. 52. V. shadows. Advanced atrophy of discs; vessels not materially diminished.

No history of nodes or of any tertiary syphilitic symptoms except the headache.

Case 172. M. C. T. Case 33. C. 119. Thos. W., 38.

Gradual failure of V. with considerable pain in forehead.

R. O.D., atrophied on *y.s.* side. Vessels of fair size.

L. O.D. pale, and its borders hazy; vessels (both arteries and veins) very much diminished on the disc, and several of them concealed close to its edge.

V. very defective in both.

No later note.

Case 173. G. 96. Geo. P., 30.

Failure of V. 6 mos.

Began in R. 1 mo. sooner than in L.

Very white atrophy of discs, with oscillation. Not much evidence of neuritis.

No history of syphilis.

Has lived abroad in the colonies.

Case 174. G. 146, and O. H. R. viii, 1, 51. Capt. W., 59.

Atrophy of discs and gradual failure of V., with deafness of one ear. Threatened R. hemiplegia.

Bleeding from throat from slight causes.

Evidence of collateral retinal circulation on one optic disc, in which the *vena centralis* is nearly invisible.

Case 175. Failure of Sight 6 months, accompanied by an increase in the severity of Sick-headaches to which Patient had been liable for the previous 5 years.

F. p. 215. Charles P. A pale, spare man.

Failure coming on at æt. 50, and progressing to almost complete blindness in $1\frac{1}{2}$ year.

Discs atrophied, and showing very slight and rather doubtful signs of neuritis. The changes more advanced and apparently older in the right than in the left eye.

Patient a smoker until about the time his sight began to fail, but then leaving it off for no special reason. Failure of sight progressing nevertheless to all but absolute blindness.

No lead poisoning to be detected.

(See also III c.)

D. *Cases which were possibly due to Tobacco.*

II e. Most of the following are probably cases of *Tobacco amaurosis*. The majority of them, however, present some complication or peculiarity, in regard either to other possible causes, or the course of the disease, or in respect to the ophthalmoscopic appearances. I have omitted from this report all cases in which the diagnosis of tobacco amaurosis was certain, having reported on them fully elsewhere.

In the first case a tropical sun may have had some influence.

Case 176. F. 242. David B., 48, sea captain.

Amaurosis and atrophy of discs. V. 14 J. barely, and $\frac{20}{100}$. Failure in 1 month, while in tropical seas, at æt. 45—46. V. remained stationary after that, till admission $2\frac{1}{2}$ years later. Was suffering from dysentery rather badly when it failed.

Syphilis severely, æt. 28.

Smokes largely, but no disagreement.

No note as to sunstroke.

Case 177. G. 60. John E., 42.

Tropical night-blindness in a sailor, but with partial atrophy of discs.

A great smoker. ? Tobacco amaurosis, influenced by bright light.

Case 178. G. 39. William C., 35.

Slight amblyopia, with pallor of *y. s.* sides of O.Ds.

V. best in dusk.

Improvement and subsequent slight relapse, both times after extra work.

Supposed to be a tobacco case, but he went on smoking throughout.

Perhaps mere accommodative asthenopia.

No hypermetropia.

? Slight astigmatism.

? Disseminated sclerosis.

Case 179. A Stationary Tobacco Case?

C. 136. George F., 47.

Gradual failure of both, but becoming stationary after a time, and V. remaining, $7\frac{1}{2}$ years after commencement, the same as at 15 months after. R. = $\frac{20}{0}$ and 16 J. L. rather less.

Atrophy of *y. s.* side of O.Ds., arteries stated to be "very small" at first visit.

A smoker. Diminished it 12 months after failure began, because it disagreed, but continued to smoke somewhat, and apparently had again increased when seen 6 years after admission.

Case 180. Probably Arrested Tobacco Amaurosis.

G. 239. Charles R., 50.

Atrophy of discs and some diminution of arteries and veins; symmetrical failure in about a year to 20 J. and $\frac{20}{0}$.

A year and half later could see 16 J.

A considerable smoker, and very nervous.

Failure arrested, though he continued to smoke; he diminished his quantity, however, by half.

The pallor of discs affected their whole area.

Case 181. F. 64. Crane B., 46.

Improvement of V. in (probably) tobacco amaurosis, without cessation or diminution of tobacco.

Gradual failure of both while at work in South America, near sources of Amazon, and during time of great anxiety and bad sleep. Failure in about 1 year till he could not see across room. Stationary 6 months; improving 3 months.

V. $\frac{2}{7}$ and 14 J.

Slight pallor of O.Ds., more on *y. s.* sides. Slight retinal haze near O.Ds.

Ps. active and small.

For 25 years has smoked about $\frac{1}{2}$ oz. daily. No note that he had diminished it.

Excellent health. No syphilis. Had no illness in South America.

Case 182. Probably an Early Tobacco Case.

F. 315. Henry R., 43.

Slight failure of V. with slight pallor of discs, especially on *y. s.* side, and doubtful retinal haze. Failure gradual during several months. All the conditions rather worse in R.

V. 1 J. barely, and $\frac{2}{4}$ each eye, but better with L.

A considerable smoker and drinker.

Slight attacks of ciliary and conjunctival congestion occasionally.

V. got no worse, and was just the same $3\frac{1}{2}$ years after admission, the pallor of discs being confirmed by observation at that date.

He left off or diminished smoking for a considerable time.

Case 183. M. C. Trans. Case 25 (and B. 175). Henry G., 31.

Symmetrical amaurosis, gradually coming on during 3 months, without other symptoms excepting sleepiness.

Gray-white discs, left the whiter, and arteries somewhat diminished.

"The whiteness very marked" 1 month later.

Published as a tobacco case.

Always intolerant of tobacco, and always easily sea-sick, though a pilot.

GROUP IX. ATROPHY OF DISCS, WITH PARALYSIS OF ORBITAL NERVES.

*"Ophthalmoplegia externa" Series.**

The cases in this series probably represent various pathological states due to different causes.

* For further facts respecting this group see paper by the author in the forthcoming volume of Medico-Chirurgical Society's Transactions.

In one of the most typical (Case 187), although the man denied syphilis, it is probable that he had had it, for his eldest living child was markedly syphilitic.

Another (Case 190) had had syphilis, but his symptoms progressed in spite of treatment.

Perhaps these cases belong to the same group as those in which atrophy of discs precedes general paralysis and insanity.

Case 185. G. 324. Maria P., 40.

Atrophy of discs and amaurosis after neuritis. Pupils widely dilated. Severe headache, with more or less sickness and constipation at intervals for 2 or 3 years during and after the sight failed.

Later on paralysis of some branches of both 3rd nerves.

No note as to syphilis.

Case 186. Paralysis of several Orbital Nerves.

L. H. Repts., vol. i, p. 48. (Case 15.) James N.

Case 187. Long Book. Robert S., 48.

Slowly progressive paralysis of 6th nerves, the R. preceding the L. considerably.

Followed by similarly progressive atrophy of discs and blindness.

Liability to attacks of severe pain in forehead, lasting some days.

Subsequent paralysis of all limbs, coming on rather quickly; liability to intense pain in the head; insanity; death at æt. about 53.

Post-mortem examination revealed no changes in the brain visible to the naked eye.

Probably had syphilis many years ago.

Case 188. J. 122. Abraham B., 72.

A fit, followed by L. hemiplegia and R. facial paralysis at æt. 68.

Nearly complete recovery.

Subsequently paralysis of 3rd, 4th, and 6th nerves on both sides, and of ciliary muscles.

No syphilis.

Case 189. J. 9. John H., 34.

Slowly progressive weakness of legs, with obstinate constipation, retention of urine, and impotence. 6 months.

Symmetrical failure of sight, 4 months. Atrophy of discs.

Subsequent progressive paralysis of both 3rd nerves and one 6th. Numbness of soles and shooting pains in legs.

Former venereal excesses and over smoking and drinking.

Intolerance of tobacco and alcohol when the other symptoms began.

No evidence of syphilis.

Case 190. C. 364. F. W. M.

Slowly progressive paralysis of several orbital muscles, followed by atrophy of discs and blindness. Beginning with the L. 3rd nerve at *æt.* 36, and remaining more advanced on that side.

Good health throughout. Temporary numbness of L. arm; "tightness" across forehead; susceptibility to heat.

Syphilis many years ago; but prolonged antisyphilitic treatment of no avail against present symptoms.

He is now *æt.* 45.

GROUP X. ATROPHY OF DISCS IN SENILE PERSONS.

Probably this series is allied to the cases in which there is also central disease of choroid. (Tay's amaurosis.) (See vol. viii, p. 231, of these Reports).

Senile Amaurosis.

Case 191. B. 75. George S., 77.

Failure gradual for 2 years, of both eyes.

Discs pale, and vessels small. Some striæ in lenses, but not enough to account for the defect.

Case 192. B. 72. William R., 76.

Symmetrical amaurosis coming on during about one week, and beginning after an unusual day's work at cabinet-making. Slight giddiness for a day or two, but no other symptoms. When first seen, could not count fingers. Ps. small, equal and fairly active.

Six weeks later V. was the same.

No ophthalmoscopic note.

Case 193. Amaurosis. ? Tobacco. ? Senile degeneration.

F. 316 and O. H. R., vii, 322. Thomas E., 62.

Commencing atrophy of discs (*y. s.* side), and gradual failure of V. in both for 18 months.

V. R. 19 J.

L. 16 J.

Ps. fairly active to light, but not fully so to atropine.

Partial deafness, and signs of cerebral degeneration.

Subject to true gout.

Has worked in lead.

A rather large smoker.

Died æt. 64; no notes of progress of V.

Case 194. G. 383. Geo. L., 67.

Failure of V. to 16 J. barely, and $\frac{20}{200}$ (with his glasses), in about 3—4 months.

Atrophy of disc, with decided but slight haze of retina in R.

No changes, or the slightest pallor in L.

Spontaneous venous pulse in both.

Opacities in vitreous of both, but these probably old, for he has had "a web" before his sight for 25 years or so.

Failure of memory.

V. remaining about the same for more than a year after admission.

No disease at *y. s.*

No proof of syphilis.

Is subject to gout.

Case 195. G. 29. Joseph B., 69.

Failure of V. gradually for 6 months down to 16 J. and $\frac{20}{200}$; defect first noticed at night.

Pallor of discs with disturbance of choroid at margins, as if from past neuritis. Vessels about normal.

Floating bodies in vitreous.

History that the eyes were very red and watery, though not painful, for 6 months before V. began to fail. It passed off about the time that V. began to fail.

No syphilis.

Has not smoked for 5 years; it used to disagree, and he left it off.

Often frontal headache; worse on R. side.
Good health.

Case 196. C. 21. Richard P., 74.

Failure of V. for three months.

Gray discs; arteries somewhat diminished, with atrophy of large patch of surrounding choroid, and in L. some choroidal disease at *y. s.*

Central opacity of each lens.

9 months later "just the same conditions;" and V. = only the largest letters.

GROUP XI. ATROPHY OF DISC AND AMAUROSIS, AFFECTING ONLY ONE EYE OR BOTH EYES WITH DELAYED SYMMETRY.

Although this group has been separated into four divisions, many points of resemblance will be noticed between the cases placed in each.

III. *a.* A group of cases of *amaurosis affecting only one eye, in which sight is usually regained*, but in the majority of cases with more or less of pallor or atrophy of the disc. When seen in an early stage there is often, perhaps generally, some evidence of intraocular neuritis; this is, however, often but slight, and in some no changes have been detected.

In one there was a history of partial temporary deafness on the same side; in another paresis of the corresponding external rectus accompanied the amaurosis, and in two others (women) there was a history of temporary paraplegia and hemiplegia many years before.

In nearly all the cases severe neuralgic pain accompanied the failure of sight; the pain was usually referred to the temple; sometimes to the upper jaw; sometimes to the forehead and eyeball. In some cases it is noted that the pain preceded the failure of sight. The pain was invariably confined to the same side as the amaurosis.

The majority of the patients are under 25 years of age, and only 2 of the number are over 40; 9 of the cases

are in women, and 5 in men. In 8 the left and in 5 the right eye was affected.

One young man attributed the failure to masturbation.

In one or two cases there were symptoms of paralysis of the sympathetic nerve on the same side of the neck.

These cases may perhaps be compared with those in which unsymmetrical paralysis, often temporary, of one of the other cranial nerves takes place, the commonest instance being the affection of the facial nerve known as Bell's paralysis; but there is reason to think that some of the other nerves, *e.g.*, the 3rd and 6th, and perhaps the 5th, are sometimes the subjects of temporary paralysis or paresis, without evident cause, and certainly without syphilis.

In some, probably the amaurosis was a symptom of impending ataxia.

Case 197. G. 170. Edwin P., 19.

Neuritis of L. only, with moderate defect of V., and no other symptoms whatever.

Slight temporary deafness in same ear a short time before.

Narrowing of palpebral fissure of same eye, but thought to have been always present.

Recovery of nearly perfect V. with pallor of O.D., and evidence of considerable choroidal change around it.

No syphilis.

History of insanity in several male members of family.

Case 198. F. 103 and O. H. R., viii, 497 (Pt. III). Evan T., 15.

Neuritis or neuro-retinitis in R. eye only, followed by atrophy of disc, and moderate diminution of arteries.

V. at first = 14 J. and $\frac{20}{200}$.

Gradual improvement to 6 J. barely.

Condition same $5\frac{1}{2}$ years later.

The failure at first accompanied by severe pain in same side of face (intraorbital region).

R. p. acts with L., but not alone.

Case 199. C. 51. Anne B., 21.

Failure of V., with advanced pallor of *y.s.* side of O.D. in L.

only, coming on in about three weeks, during an attack of severe pain in the L. forehead.

V. = 1 J. puzzling out the words, with L. eye.

R. eye; O.D. perfect and V. not affected.

Had no pain in R. forehead.

9 years later she wrote that L. was neither better nor worse.

Case 200. C. 250. Walter M., 20.

Failure of R. to 20 J. in association with some pain in R. forehead.

Ophthalmoscopic exam.: negative.

Gradual recovery of V. No cause assigned.

Case 201. C. 253. Janet A., 43.

Neuritis and blindness of L. only; failure of V. coming on very quickly (in 2 days), with severe pain in forehead. Admitted 3 days after failure began, all but blind.

R. eye perfect.

In one month (under 5 gr. doses of iodide of potassium); V. $8\frac{1}{2}$ (words) barely, and $\frac{20}{100}$; O.D. partially atrophied and artery diminished.

The headache was chiefly on L. side of forehead, but not entirely restricted to it. It began when V. began to fail, not before. It ceased entirely after 2—3 weeks' treatment.

Case 202. ? Neuritis with Vaso-motor Paralysis.

G. 82. Elizabeth G., unmarried, 30.

Failure of L. in about a week down to perception of large objects, accompanied by neuralgia of L. temple. No cause assigned.

Slight neuritis (haze and slight swelling), followed in 3 months by slight pallor (3 observers).

Recovery of V. from large objects to 2 J.

Other symptoms;—Redness and heat of L. ear, and narrowing of L. palpebral fissure.

Case 203. G. 185. Wm. L., 19.

Slight retinitis of R. eye, with paresis of R. external rectus.

Chronic otorrhœa on R. side for years.

Headache in R. forehead for a few days before failure.

Perfect recovery of the external rectus under iodide. Slight doubtful traces of retinal mischief remaining.

No syphilis.

Case 204. B. 249. Huntly D., 19.

Failure of L. eye only, coming on in a few weeks, and remaining stationary (16 J. slowly) for many months. Retina slightly hazy; arteries perhaps slightly too small.

Previously liable to severe pain in L. cheek and forehead not known to be in relation to teeth, but bicuspid carious and liable to ache.

The failure attributed by him to masturbation.

Case 205. Mrs. L., 22.

Rapid failure of L. eye in one week down to no p.l., while nursing sick husband.

Good health, but nervous and hysterical, and complains of a weight at top of head, giddiness, and of difficulty in understanding things.

Slight pallor of O.D.; veins rather turgid and arteries small; but changes very slight. Some pain just over the eye.

History of paraplegia for a long time, after a fall, at æt. 13—14; recovery perfect.

Case 206. Monocular Amaurosis, with Neuralgia.

B. 195. (Seen with Mr. Streatfeild), woman about 50.

20 years ago became blind of L. eye, with severe pain in the forehead and eye during the failure. The pain afterwards became less and ceased.

Now advanced atrophy of disc.; artery visible, but probably diminished.

History of partial L. hemiplegia some years ago. No fits.

Case 207. Amaurosis of one Eye without Changes.

B. 110. Mrs. L., 26.

Failure of R. during one night one week before admission, without other symptoms. V. cannot count fingers. Ophthalmoscopic appearances quite n., excepting fulness of veins.

Occasional convergent strabismus of R.

Has recently had severe hæmoptysis, but does not look in the least phthisical.

Case 208. O. H. R., Vol. vi, p. 273. Miss A.

Atrophy of one optic disc, with much diminution of central vessels, following rapid failure of sight (in 24 hours).

The blindness came on at the same time with paralysis of the corresponding 3rd nerve, and with pain in the same forehead. The pain lasted 3 weeks.

Conjectured descending neuritis affecting optic and 3rd nerves.

Case 209. Miss O. (Case occurred several years ago.)

Failure of L. eye only, with extreme dilation of pupil, without ophthalmoscopic changes, and without head or nerve symptoms. No p. l.

Recovery of V. sufficiently to read newspaper, while away on the continent. Subsequently died of phthisis.

Relapse of failure of V., with dilated pupil, on return to England; *with pallor of disc.*

Patient phthisical.

History of a short attack of hemiplegia 3 years before the amaurosis; and of diplopia (but no squint) when V. began to fail.

Case 210. B. 198. Mrs. S., 22.

Failure of L. eye in one night to no p. l., 4 months ago (when 3 months pregnant); scarcely any ophthalmoscopic change (slight haze).

Now pregnant 7 months, with 2nd child.

Health seems perfect, except much uterine sickness during the early months of this pregnancy, but it ceased at about time when eye failed.

Æt. 14 to 16 had a 2 years' attack of paraplegia, ending in recovery with the first appearance of menstruation. The recovery took place without treatment.

Not hysterical.

GROUP XI. B.

Cases of *failure of sight in one eye, with partial or temporary failure of the other, and more or less marked atrophy of disc.* The failure sometimes going on to total blindness, in others partial or complete recovery.

In several of the cases there was pain on the side of the head corresponding to the worse eye. The character and exact seat of the pain, and its relation in time to the onset of the amaurosis, however, vary a good deal.

Case 211. Neuralgia with structural changes in Eye.

G. 289. Thos. R., 36, traveller.

Failure of both rapidly during an attack of severe neuralgic pain at back of neck, and in R. side of head and forehead. Pain in neck "like a bad stiff neck."

There was never any sickness.

L. very soon recovered.

R. remained defective, but gradually recovered (while taking iodide and bichloride) almost perfectly. The pain also ceased.

Subsequent relapse of severe pain and dimness of R.; pain cured by a local application, and V. restored.

On admission. R. A few small opacities in vitreous, and a single speck in lens; slight neuro-retinitis.

1½ year later, O.D. of this eye decidedly paler than other, but vessels of good size.

No evidence of syphilis.

Case 212. G. 375. Lecture Case. Wm. B., 41.

Slowly progressive atrophy, one eye failing many years before the other.

Tertiary syphilis probable.

Case 213. G. 193. Chas. D., 19.

Neuralgia of L. side of head, with stiffness of same side of neck and failure of L. eye.

9 months later;—partial atrophy of L. disc, probably after neuritis. Slight defect of the other eye (enlargement of blind spot outwards).

No syphilis. No rheumatism. No evidence of vaso-motor paralysis.

1876. Now atrophy of both discs and blindness.

Case 214. G. 256. Alfred D., 38. Partial atrophy of R. disc, and considerable defect of V.

Defect probably began several months ago.

Other eye, ? slightly affected, but V. nearly perfect.

History of accommodative failure before definite mistiness began.

Case 215. G. 259. Mrs. S., 45. Slow failure of L. to total loss of p. l., with atrophy of disc, and great diminution of retinal arteries.

Failure of R., beginning some months after L. had become blind, and preceded by symptoms of accommodative failure. Slight pallor of disc, and minute spots of disease of choroid at *y.s.* (as in early cases of Tay's disease). Improvement of V. of R. after long stay at seaside.

Liable all her life to nervous headaches, and various nervous symptoms; easily upset by worry; but no very uniform or constant symptoms. Has had children.

One daughter went through a severe attack of Grave's disease, at *æt.* 21. It began a month or two after extraction of some teeth under nitrous oxide. She is now well.

Case 216. G. 398. Mrs. S., 26.

Some gradual failure of L., followed in 2 months by sudden total blindness of R. The latter followed by much severe pain in temples, with disturbed sleep, lasting some months.

The blindness of R. permanent, at first with slight haze of disc and retina, passing into advanced atrophy with considerable diminution of vessels.

The defect of L. (14 J.) passing off in a few months (2 J.). O.D. perhaps slightly pale.

Ps. R. motionless, and of ordinary size throughout. L. at first active; afterwards excessively sluggish, and always remaining rather larger than R.

Various general nervous symptoms (languor, &c.).

No evidence of syphilis.

Case 217. Amaurosis, unequal and with long delayed symmetry, with one-sided Headache over each Eye when failing.

O. H. R., IV, 126, and B., 48-9. Philip C., 35.

At *æt.* 28, L. began to fail, accompanied for 3 months by severe headache, chiefly over L. forehead. Has since had slighter headaches. L. eye continued to fail slowly for about 6 years,

when it had bare p. l., and same state was noted 9 years later (1871). Blue-white atrophy and shelving cup.

R. began to fail about 7 years after L., with similar pain over R. eye. V. about 8 J., and partial atrophy of O.D. In 2—3 years again had same, R.-sided headache, but eye no worse. 9 years after admission, V. of R. still can see 8 J. Haze and pallor of O.D.

Ps., L. larger than R., and fixed. R. alters in size only when eye is rubbed.

Headache chiefly in morning.

Case 218. B. 53 and 66, and L. H. R., I, 52, Case 25. John P., 24.

Amaurosis beginning in L., and in it advancing to V = 20 J. barely, with pallor of disc.

While under care the R. failing to absolute blindness, without pallor of disc, but with some diminution of retinal arteries.

Patient seen 6—8 weeks after failure of L. began, and remaining under care 5 months.

Great sleepiness; some loss of colour and flesh, but no other symptoms, excepting considerable aching pain in L. globe and orbit when failure began, followed by severe flying pains in L. jaw and face, for which he had a bicuspid tooth out, the fang being inflamed (Mr. Coleman).

Pupils at first sluggish, the L. more so, and rather large. They subsequently dilated, and R. became quite motionless, L. retaining some movement. They dilated at first, while he was taking belladonna, till symptoms were produced, and remained dilated for 2 months afterwards.

Case 219. B. 349. L. H. B. 227. James S.

Æt. 34. Intense pain in L. forehead, preventing sleep, and failure of L. eye to complete blindness in 6 months. Pain ceased when eye became quite blind.

September, 1863. Æt. 38. Failure of R. eye, with severe pain at back of head, and some in front, but not localised in forehead.

May to June, 1864. Æt. 38—9. In London Hospital for pains in back of head, relieved by large doses of iodide.

September, 1865. Æt. 40. Again in Moorfields and the London, with atrophy of L. disc and headache. "R. eye perfect." General health excellent.

October. "Pain almost gone. Black specks before R. increasing."

Gonorrhœa more than once, but no evidence of syphilis at æt. 34.

1870. Æt. 45. L. no p. l. Advanced atrophy of disc, and doubtful evidence of past neuritis. R. V. $\frac{2}{2}0$ and 1 J.; slight atrophy of disc.

Case 220. B. 317. Mrs. G., 33. A widow for 7 years.

$2\frac{1}{2}$ years ago, severe frontal pain over R. eyebrow, limited to small patch of skin, and persisting for many months, and less often for 2—3 years. Not nocturnal. No sickness.

2 years ago, R. eye began to fail, and became quite blind in about 12 months.

July, 1865. Now, O.D. very pale, vessels normal size. Choroid at O.D. disturbed. No other disease.

June, 1866. Same. P. same as L., and active with L., but not alone. Still subject to violent pain over R. eye. 3 months ago, L. eye began to fail. V. 6 J., close to and about $\frac{2}{1}00$. Fundus, n. The same choroidal disturbance about O.D. as in R. Has had no pain in left forehead. P. normal size and active.

June, 1866. V. no worse.

Never before subject to headaches. Habitually scanty menstruation. Cannot bear cold or light to the eyes.

No note as to syphilis.

Case 221. L. II. R. I. 56, Case 37 (and B. 96). Benjamin E. S. Intemperate, and a large smoker.

Failure of both eyes about 6 months.

L. much worse than R.

V. R. = 1 J. barely; L. = 10 J. barely.

Pallor of discs, L. more than R.; also diplopia in looking downwards.

GROUP XI. C.

A small group of cases in which both discs are more or less atrophied, but only one eye seriously defective.

No history of any special neuralgia.

Tertiary syphilis probable in all the cases, and history of other paralysis in one patient.

Case 222. G. 359. (Copied for lecture.) John B., 41.

Atrophy of discs, much more in L. than R.

V. very imperfect in L., good in R.

Syphilis 20 years ago.

Nodes on skull 4 years ago, with only slight headache.

? Atrophy from syphilitic disease of dura-mater, or brain, at base.

Case 223. C. 339, G. 111. J. H., 43.

Amaurosis with atrophy, more advanced in R., 1 month

— Slight R. hemiplegia, 3 months.

Extreme myosis.

2 years later R. counts figures.

„ L. V. very good, but discs as before; *both* much atrophied.

History of some defect of V. many years ago.

Syphilis possible 3 years before the hemiplegia and atrophy, but not proved.

Case 224. G. 236. Chas. R., 46, draper's assistant.

Atrophy of discs, much more advanced in R.

Great defect of R. ($\frac{20}{200}$ and 10 J.); noticed 3 months.

No defect of L.

2½ years later, R. (no p. l.) advanced atrophy of disc.

„ L. partial atrophy, but no defect (1 J. easily).

Remotely syphilitic, but no symptoms since the secondaries at æt. 23.

Has very large family.

Shortly before R. failed he was weak and ill and had some vomiting.

Deafness of L. ear from childhood, with otorrhœa.

History of liability to earache and sudden severe pain at back of head on L. side.

GROUP XI. D.

Progressive amaurosis, with atrophy of discs, beginning in one eye considerably before the other and probably ending always in total blindness.

Other symptoms often very slight, but in the case which is taken as typifying the group, as well as in some of

the others, there have been various other indications of slowly-advancing disease of the spinal cord or brain.—(Case 232).

Smoking does not appear to have had any share in the causation.

It is by no means certain that all the cases belong pathologically to the same group, or that further study will not result in distributing them among other clinical groups. A considerable share may probably fall to that of loco-motor ataxy.

Case 225. M. C. T., C. 1, Case 9. Geo. W., 38. Widower since æt. 27.

Very slow failure of V., beginning in L. before R., and progressing to all but total blindness in both in about 5 years (æt. 33—38).

Photopsiæ and variations of sight at first. Atrophy of discs and diminution of arteries. Ps. small, equal, very sluggish.

Had formerly been very liable to epistaxis (a family complaint). Has never smoked at all. No other symptoms.

8 years after admission and 12 years after failure began he was all but blind, but in good health, except occasional giddiness.

Epistaxis ceased some years ago.

Case 226. C. 211. Chas. G., 32. Healthy farm labourer.

Failure of R. began at Christmas; it was quite blind in 2—3 months.

About 1—2 months after R. had become blind, L. failed, and in a fortnight was quite blind.

Some pain in forehead, but not severe, and not coming on till after both eyes had failed.

7 months after commencement of failure of first eye.—No. p. l. Ps. dilated and fixed. Yellowish atrophy of discs, with moderate diminution of arteries and veins. But little evidence of neuritis. the L., however, being the more suspicious.

Had not smoked for 5 years.

Case 227. C. 299. George B., 38.

Atrophy of discs and amaurosis, more advanced in L.

Failure began 2 years ago and L. was affected before R.

No pain in head. No syphilis. Has never smoked.

Case 228. G. 366. (Copied for Lecture.) Douglas S., 57, a negro.

Neuritis ending in atrophy, with diminution of retinal vessels
Ps. dilated and fixed.

Interval of 11 years between the 2 eyes.

No cause found. No syphilis. Health good.

Case 229. F. 59. Wm. A., a German.

Amaurosis, with atrophy coming on in one several years before the other.

L. began to fail 7 years ago. Quite blind 2 years.

R. began to fail 1 year, and is getting worse.

Blue-white atrophy of both, with slight shelving cup. Arteries a good deal diminished. Ophthalmoscopic condition about the same in the 2 eyes.

No syphilis. Tobacco not mentioned. Good health but getting weaker for 2—3 years. Drinks scarcely any alcohol. Unmarried. Denies onanism.

Case 230. Amaurosis with delayed Symmetry.

L. H. R. I 54, Case 31 (B. 80). Stephen B.

Slowly progressive amaurosis, beginning in L. considerably earlier than in R. and ending in nearly complete blindness, with white discs and much diminished vessels. "Discs opaque."

Much pain in back of neck, and from the beginning great sleepiness.

Admitted 5 years after 2nd eye became blind, and was then in good health.

Ps. sluggish, rather large, and L. rather the larger. Eyes diverge.

No note as to syphilis.

Case 231. G. 147. John P., 25. Notes extend over 2 years.

Failure of V. gradually in both eyes, but progressing at unequal rate in the two, and going on to complete blindness without other symptoms.

Slight neuritis in early stage.

Imperfect action of ps. with atropine; in one eye T. —. and

slight ciliary congestion when first seen 6 weeks after failure began.

A smoker, and never left it off. Risk of syphilis denied. No evidence of hereditary taint.

Case 232. Lecture Case. Mr. W., of P.

Slow failure of R. with, at first, some haze and swelling, followed in about a year by failure of L., at first temporary, but afterwards permanent.

Partial atrophy of discs following many months after the failure of V.

History of tenderness of the eyeballs in the early stage and at one time severe pain in them. Pain behind the eyes.

Other nervous symptoms;—

“Stupid” feeling at back of head. Faintness from hunger.

Cold feet, increasing to numbness of feet and knees, especially R. knee. Uncontrollable movements of leg in the morning.

No alteration of sexual power, but some difficulty in beginning micturition. Sometimes severe occipital and R. temporal headache.

No syphilis.

I believe that ataxic symptoms came on a year or two later.

Case 233. G. 181. Benjamin C., 54.

Failure of L. $2\frac{1}{2}$ years.

„ R. 2 years, or rather less.

Stationary for last 3 months.

Atrophy of discs, chiefly on *y. s.* side, and with considerable choroidal disturbance. Arteries much diminished. V. not noted.

Slight frontal headache and marked diminution of sexual desire since V. failed.

No other symptoms.

Was never able to smoke easily, and used only $\frac{1}{2}$ oz. a week. Continued to smoke this quantity till long after V. failed, when he gave it up. No syphilis. No lead.

Case 234. Slow Amaurosis with delayed Symmetry and no other Symptoms. ? Sexual excess as a cause.

B. 147. John P., 44.

Gradual failure of L. eye during a year or more, followed by

very slow failure of R. during several years, and not beginning till L. had been nearly blind for a year or more.

Ultimate total blindness, with atrophied discs, and no great alteration of vessels.

Myosis at first: subsequently, when quite blind, ps. of ordinary size, but sluggish.

The failure of V. accompanied by great contraction of fields.

No clue to cause excepting great sexual excesses, but without telling upon his general strength.

Case 235. M. C. T. Case 21, and B. 203. Thos. C., 46.

Failure of both, but not synchronously.

L. failing 5 years, and blind 3 years.

R. blind 6 weeks.

Atrophy of both discs. L. much more than R.

Myopia.

Excessive sexual indulgence formerly, and drank and smoked freely.

At present sexual system nearly in abeyance; testes flabby; considerable varicocele.

No evidence of syphilis.

8 years ago had a fit, followed by temporary partial hemiplegia. Often has giddiness.

Case 236. C. 366 and O. H. R. VII, 177, Case 11. Samuel B., 61.

Gradual failure, beginning in R. several mos. before L., and remaining more advanced in it; becoming stationary in about a year. Atrophy of discs; more in R. than L.

No other symptoms.

Died suddenly; æt. 63; no details.

Case 237. L. H. R., I, 55. Case 35, and B. 81. Robert T., 59.

Amaurosis beginning in L. 6 months before R.; subsequent improvement for a time followed by relapse. Failure began 2 years before admission, when he was also under treatment for giddiness to which he had long been subject. Habitually very sleepy, but perhaps only from his occupation (musician).

Ps. smaller than n. and quite motionless; L. larger than R.

Free smoker and drinker.

Case 238. O. H. R., vol. iv, p. 241. Richard B., 36.

Temporary loss of sight in both eyes, with a week of severe

headache. One eye remaining permanently very defective, the other recovering perfectly.

5 years later;—Headache, epileptic fits, and loss of sight in the second eye, without changes. Gray-white atrophy of the first eye: no changes whatever in the second.

Case 239. Peter P., 62.

Progressive failure of both, but R. worse than L.

V. remaining stationary at about 16 J. with R., and 12 J. with L., with + glasses, during his 6 months' attendance.

Pallor (decided) of R. O.D. L. shows scarcely any changes.

No symptoms of disease of cord or brain.

Ps. equal and act fairly.

Perhaps a tobacco case, for failure stopped when he came under care, and nearly gave up smoking. But if so, it is unusual in the imperfect symmetry.

Case 240. Mr. J., 48, shoemaker.

Amaurosis, with interval of a year or more between the eyes, going on to no p.l. Failure rather rapid (about 3 months). Atrophy of discs and great diminution of arteries; R. paler than L. and with more changes, suggestive of neuritis.

Health good throughout.

Spare, nervous; formerly very subject to epileptic fits; none for last 3 years. A nephew had fits. No sexual failure or symptoms of ataxy. Much frontal headache when second eye failed. Very susceptible to cold on his face; it causes a shooting pain which passes down neck; much feeling of cold down back. Never sunstroke or injury to head. No syphilis.

Case 241. C. 261. Wm. G., 56.

Progressive failure of V. 9 months; unequal in the two eyes. R. the worse, and V. in it reported to vary on different days. The R. also subject to attacks of redness (or ecchymosis?); a number of large ecchymoses on admission.

Subject to pain about R. orbit.

Atrophy of discs with diminished arteries and veins; much more advanced in R.

Ps. very small and nearly fixed.

V. R. $\frac{2}{200}$ and words of 18 J.; L., $\frac{2}{70}$, and words of 8 J. badly; improved by + glasses to $\frac{2}{50}$ and 4 J.

Health good.

No note as to syphilis.

Has been deaf 15 years.

GROUP XII.

Embolism.

Case 242. John B., 63.

Atrophy of R. O.D. only, and great defect of V. Found out about a year ago, but may have been as bad for some time. Arteries very small.

L. good.

Case 243. B. 282 (probably published in one of the Journals at the time). Alfred B., 18.

Sudden and nearly total blindness of L. eye; 7 months later advanced pallor of disc, arteries extremely diminished, and those to the (real) lower part invisible; veins diminished to about half.

History of a transient attack of total blindness, lasting only a minute or so, in other eye 2 or 3 months after the permanent attack in L.

Heart's action tumultuous, but no bruit.

No doubt embolism of arteria centralis retinae.

Case 244. A. 2, 161 and B. 23. Richard W., 54 (1862-3).

Sudden failure of left, followed by atrophy and diminution of vessels.

Nearly blind.

Subsequent sudden partial hemiplegia.

Probably embolism of central artery or some branches.

Case 245. F. 83. Wm. K., 38.

Sudden failure of L., 3 weeks. V. returned in 2-3 hours, and remained good for a week.

Second failure, during sleep, 2 weeks.

Ophth. appearances of recent embolism. V. 20 J. barely.

2 weeks later (4 after second failure) retinal haze had disappeared. V. 19 J. barely.

Loud systolic bruit at base of heart. History of rheumatic fever 20 years ago; and of scarlet fever followed by some rheumatism 5 months ago.

Case 246. G. 357. John B., 45.

Embolism of some branches of R. arteria centralis retinae.

Absolute permanent blindness.

15 months later embolism of L. arteria centralis.

Fit 2 weeks before second embolism.

(Two drawings made, by Burgess, of the eye first affected, at different stages.)

Case 247. G. 4. Isaac B., 71.

Atrophy of R. disc, and V. = shadows. Arteries somewhat, but not much, diminished.

History of sudden onset 20 years ago, the eye becoming blind in a day.

L. eye nearly perfect.

Probably embolism.

R. p. small, and does not act to light : acts to atropine.

L. p. active.

Striae in both lenses.

Case 248. G. 266. Albert L., 26.

Neuro-retinitis of R. only, affecting chiefly the (real) lower and outer part of retina (towards *y.s.*). Corresponding defect of field.

Dimness noticed 4 weeks.

L. perfect.

Ps. equal and active.

Possible syphilis 2 years ago.

? Embolism of a branch of art. cent. retinae.

GROUP XIII.—SUSPECTED HÆMORRHAGE INTO OPTIC NERVE.

Probably *hæmorrhage into optic nerve sheath* or into the substance of the nerve, *or aneurism* pressing on the Nerve.

Case 249. History of Temporary Paresis of Sensation in the Right Fifth Nerve: Sudden Failure of Left Eye, rapidly passing into Total Blindness: no Disease in the Eye-ball itself: Diagnosis, Effusion of Blood into Left Optic Nerve-sheath.

B. 44 (already published in one of the Journals).—Mrs. U., aged 54, was admitted July 1862. She was healthy-looking, and had never been ill before—never in bed a day. She was not

liable to giddiness, but now and then to a little swimming. All of a sudden, six or seven weeks ago, she had numbness of the right side of the upper lip, cheek, and side of the nose. The skin felt dead. When she went into the air, it felt as if she put her whole face into ice. This troubled her so much, that she used to cover her face with her handkerchief when she went out. At this time she had great difficulty in keeping her hands warm; they were always cold. Her feet were not cold. At present she has quite lost these symptoms, and her hands are warm. Her legs then swelled; they had never done so before, and were quite gone down when she was admitted. Suddenly, a week ago, whilst sitting at work one afternoon, she noticed a sort of dimness before her eyes. In trying them, she found the dimness was before the left only. In the course of a few hours, the dimness had advanced to total blindness of the left, and she had no perception of light. There was no giddiness, sickness, or other cerebral symptom. Her appetite was good. She was active, and always rose at five.

When admitted, she could not with the left eye see the sun or distinguish the window. The other eye was perfect. The left pupil was a little larger than the other, and quite motionless; it dilated to thrice the size of the other when the other was covered, and remained quite fixed; contracting immediately on light being admitted to the other; under atropine, it dilated well. The media were clear; the vessels of the retina were seen clearly; the veins were rather large; the arteries small. The optic disc was normal and the yellow spot healthy.

Diagnosis.—Effusion of blood into the optic sheath, or else an intracranial aneurism pressing on the nerve.

Case 250. B. 27. Alexander N., 59. January, 1862 or 1863.

Sudden amaurosis of R.; a few days later, pallor of disc and very slight haze of retina; *y.s.* normal; retinal blood supply not extremely deficient, indeed nearly as good as in other eye.

20 years ago had some sort of fit.

? Embolism.

? Effusion or hæmorrhage into sheath of O.N.

Case 251. G. 118. Wm. L., 66.

Probably embolism of arteria centralis far back in optic nerve, or hæmorrhage into optic nerve.

Atrophy of disc and changes at *y. s.* Great diminution of arteries, but they remain pervious.

V. counts fingers.

Bleeding from throat or lungs while under care, without apparent reason.

IV. *c. Neuritis in Secondary stage of Acquired Syphilis.*

Case 252. Lond. Hosp. 1871, pp. 178, 327. Benjamin J., 26, a marine discharged from the service as incurably blind $1\frac{1}{2}$ year before coming to Moorfields; (probably for iritis).

Double neuritis, worse in one eye, $2\frac{1}{2}$ years after primary syphilis treated by mercury to salivation, and 2 years after well-marked secondary disease with iritis.

The neuritis ("white woolly" discs), accompanied by opacities in each vitreous, and by peripheral choroiditis of superficial character.

He improved under iodide from 4 J. (with better eye) to $1\frac{1}{2}$ Sn. and $\frac{2}{10}$ in 6 weeks, while the neuritic lymph became partly absorbed. The worse eye (20 J.) is not separately noted as to vision after first note.

Case 253. Neuro-retinitis causing blindness in Secondary Syphilis.

C. 360. Wm. R., 24.

Amaurosis (p. l.) and atrophy of discs with some remains of lymph still present, 3 years after failure.

Failure rapid (in 1 week) after several months of severe headache and during secondary syphilis. (Chancre, about 6 months before failure of V.).

Case 254. Double Neuritis in Secondary Stage, probably without Gumma.

C. 320. Jane O., 32. Acute double neuritis, swollen discs, opaque effusion extending for a little way into retina; extravasations. "Sight dim." Iodide of potassium. In $2\frac{1}{2}$ months V. perfect again; in 5 months, neuritis almost gone, still remains of lymph. She had had syphilis severely 18 months before. Attended me first at Skin Hospital for tubercular secondary syphilide.

No cerebral symptoms.

Case 255. C. 231. Philip R., 46, a sailor.

Results of syphilitic neuro-retinitis.

Atrophy of discs.

Failure of L., 15 months, or more.

„ R., 4—5 „

On admission, L. = shadows.

R. = 12 J. barely, and $\frac{20}{100}$.

Ps. very sluggish; L. almost motionless.

Syphilis fully 18 months ago, and was salivated for it. Now no signs of syphilis.

GROUP XIV. — NEURO-RETINITIS DUE TO LEAD-POISONING.

Case 256. B. 25. Ludwig H.

Amaurosis, symmetrical, beginning 2 years ago, in a man who had worked 3—4 years in lead factories, and had several times during that period been laid up for many weeks at a time with lead symptoms (colic and constipation; never paralysis).

Can see large objects dimly; R. rather worse than L.

Case 257. B. 345. Ellen N., 32.

August 31, 1865. Duration about 2 months. Coming on while ill with symptoms of acute general lead poisoning; pains in limbs, colic, dry retching, loss of appetite, severe headache (chiefly frontal), paresis and numbness of L. hand and both feet.

Can scarcely tell light from dark. Discs pale, and their margins milky, but not much swollen.

In 2 months, the numbness had quite gone, and sight improved to 20 J. with the better eye.

In 15 months, the better eye saw 18 J. held close; the worse eye 20 J. also very close.

IV. *e. Sudden symmetrical amaurosis, or hemiopia, without changes.*

Probably central cerebral hæmorrhage, or embolism.

Case 258. Bag. David J., 54.

A senile-looking letter carrier. Sudden symmetrical failure of V. down to shadows in a few hours without a single head symptom. Imperfect action of internal and external recti.

Ps. sluggish, and R. rather the larger. Ophth. negative.

Unaccountable differences of V. on different days. Manner hesitating and slow.

Great defect of visual fields, with tendency to hemiopia.

V. no better a year later.

Malingering suspected, but afterwards given up.

Probably hæmorrhage, or embolism of optic centres.

Case 259. B. 284. Fredk. B., 32. Sailor.

Probably feigned amaurosis.

Sudden failure of both eyes, in one night, on board ship, so that he had to be led about.

10 months later V. only letters of 20 J., but can tell time by clock.

No ophthalmoscopic changes, unless slight pallor of *y.s.* side of R. O.D.

Case 260. C. 262. John D., 64.

Failure of both in half an hour, down to counting fingers; coming on in the morning whilst at work (cutting turf), and accompanied by giddiness. Had to be led home. 3 weeks later. V. just the same; cannot count fingers easily. Ophth. exam. negative.

Ps. medium size.

Health good.

The evening before the failure, he had been cleaning a very offensive cesspool, and attributed the failure to it.

Case 261. G. 254. Mrs. S., 51.

Sudden loss of V. ("like a flash of lightning") 18 months ago, whilst engaged in cooking. Since then occasional temporary improvement, but never to any great degree.

Now, R., no p. l.

L. shadows.

Slight pallor of discs.

From childhood subject to sick headaches; worse last few years. No distinct attacks of loss of V. with the headaches, but history of "dizziness." Still subject to great pain, chiefly frontal.

During the last 6 years had had several fits, with temporary hemiplegia of face.

Menstruation regular since æt. 9.

No strong evidence of syphilis.

Case 262. F. 74. Saml. C., 52 (from Dr. Sutro).

Vertical hemiopia, patient's L. half of field being very defec-

tive (= shadows), while with R. half he can read 2 J. easily, unaided.

The extreme periphery of the defective part seems to see better than the more central part.

It came on, with giddiness, one morning about 3 months ago. Felt confused as if after drinking. No other nervous symptoms.

Good health. No syphilis.

GROUP XV. — AMAUROSIS AFTER ERYSIPELAS OR HERPES ZOSTER.

Case 263. Neuritis in Erysipelas of Head.

B. 231. George M., 59.

Had erysipelas of head 15 months before admission. When he recovered was nearly blind for a few weeks; then one eye (the R.) improved till he could read with it, and again failed.

When I saw him, the L. eye was quite blind, the disc white, its sheath much too conspicuous, "uneven and fluffy," the retinal vessels represented by bloodless white lines, and the retina showed abundance of small white dots.

With the R. he could barely see 8 J.; there was no ophthalmoscopic change, except too great conspicuousness of the sheath.

A year later his sight was no worse, perhaps a little better.

Case 266. O. H. R., V, 207, C. 98. Maria L., 50.

Amaurosis with pallor of O.D., with ptosis and mydriasis, ulceration of cornea and doubtful iritis, in severe herpes frontalis et nasalis.

The ptosis afterwards nearly disappeared, but the mydriasis and defective sight remained.

GROUP XVI.—AMAUROSIS IN ASSOCIATION WITH UTERINE OR OVARIAN DISEASES; PREGNANCY, &C.

This small group contains several cases in which the relation between the amaurosis and some special condition of the sexual system is perhaps open to doubt.

In the first 3 cases, however, there seems reason to associate the failure of sight with some peculiarity of the system shortly after parturition and while suckling.

In two of them there was the history of a temporary failure after a previous confinement, and of other nervous symptoms.

(See also Case 23.)

Case 267. Amaurosis during Lactation.

B. 152. Mrs. T., 28.

Failure of V. 6 weeks after confinement; confinement 6 months ago. R. eye suddenly became worse a few days ago; its disc paler than L., and arteries much smaller than natural, and smaller than in other eye.

Case 268. Amaurosis during Lactation.

B. 49. Mary F., 39.

Amaurosis without intraocular changes excepting fulness of retinal vessels and some degree of congestion of discs. V. 19 J. barely, better with R. Ps. very sluggish, medium size, L. rather the larger.

Failure occurred gradually soon after last confinement 6 months ago. Had been ill and weak all her pregnancy. Had a good confinement.

3 months ago a fit, followed by partial L. hemiplegia for few days, and V. much worse after it. Was very sick with the fit. 1 month ago a 2 hours' attack of total blindness.

Very sleepy. No albuminuria and no cedema.

For years liable to occasional tingling in L. face, arm, and leg.

Case 269. O. H. R., vol. vi, p. 278. Mrs. C. N., 42.

Gray atrophy of both discs with some diminution of arteries and blindness.

One eye failed gradually 4 years ago, and the other about 2 years later. Severe headache on same side as failing eye, first one side, then the other.

Failure beginning just after confinement.

Temporary failure of sight with insensibility (? uræmic) 20 years before, also after a confinement.

Case 270. F. 330. Mrs. C., 27.

Neuritis followed by atrophy and amaurosis; L. more advanced than R. in all respects.

Ps. R. fairly active; L. scarcely acts at all.

Failure about 6 months or more.

3 years ago, became for 18 months liable to vomiting; it began several months after 2nd confinement, and ceased after the 3rd = 18 months ago.

During 3rd pregnancy, history of spasmodic seizures with temporary loss of consciousness.

Lately, history of many short attacks of loss of speech without loss of consciousness.

No note of exam. of urine.

No note as to syphilis.

Case 271. Neuritis with delayed Symmetry during Lactation.

C. 355. Mrs. F., 23.

Married 2 years.

1st confinement 11 months after.

1 month after it, R. eye failed and was quite blind for a time, then improved. Now (12 months after failure) V. 2 J. and $\frac{2}{10}$; disc in advanced atrophy.

10 months after R. failed (*i.e.* 2 months before admission) L. failed. V. not fingers; neuritis well marked.

3 weeks later considerable improvement ($\frac{2}{10}$ and 10 J.) and much less lymph on O.D.

She was still suckling when admitted.

Case 272. B. 323 (probably published). Mary P., 50.

Total blindness (no perception of light) coming on in connection with very severe headaches at age of 16, and remaining permanent.

Menstruation did not begin till 2 years after the loss of sight: regular but always scanty. Subject to headaches in girlhood.

Within the last 2 years has had two severe illnesses attended with sickness and headache, and in both cases by complete deafness. She can now hear well.

An elder sister, whose menstruation began earlier, has had tolerable health.

Advanced white atrophy, with slightly jagged choroids and greatly diminished retinal vessels.

Case 273. B. 155. Sarah W., 15.

Alternating amaurosis; repeated attacks in both eyes, soon after commencement of menstruation.

More or less complete ptosis.

History of asthenopia for 2 months. Then a sudden giddiness with loss of V. and loss of consciousness for a short time. Another similar attack ending in total blindness of L.

During the next few months occasional giddy attacks and temporary blindness of the R. eye also. Once V. of L. (worse eye) returned for a few minutes.

Ophth. changes very slight; veins full; artery in L. eye too small.

Menstruation continuing regular and free throughout. Appetite good.

Noises in ears.

Case 274. G. 188. Mary Anne H., 19.

Neuritis of both with retinitis extending for some distance. Incomplete atrophy of both discs (pallor uniform all over) without diminution of central vessels.

Permanent defect of V. in one eye, and no damage at all to the other.

History of strabismus at one time.

Patient since menstruation began (æt. 13), liable to attacks of illness, lasting 3 months or more, usually occurring in the summer, and characterised by severe headache (vertex), sickness, and prostration. Has had a "fit" without loss of consciousness. No suppression of menses.

The neuritis occurred during one of these illnesses.

Extreme anæmia. History of œdema of one leg and some affection of heart and one lung.

History of "fits" in a sister.

„ "sunstroke" in a brother.

„ nervous headaches in another sister and in mother.

Case 275. B. 71 and L. H. R., I, 53. Case 29. Mary Anne G., 19.

Amaurosis gradually coming on for 1 month; symmetrical.

General anæmia and history of former œdema of feet.

No changes in eyes, except anæmia, proportionate to that of the body generally, and slight retinal haze.

Very severe occipital headache. Drowsiness.

Ps. moderate size, equal, fairly active.

Case 276. Amaurosis with delayed Symmetry and Choroidal Disease.

C. 270. Mrs. W., 52.

L. failing more than a year; bare p.l. for last 6 months. Atrophy of disc; vessels of fair size.

R. slowly failing, but not so bad as L. O.D. not so pale, but central artery smaller than in L. Large patch of abruptly atrophied and pigmented choroid at extreme periphery. No other choroidal disease except a few indistinct spots of extravasation.

Myopic.

Some pain in head, but usually good health.

Failure attributed to cessation of menses.

History of temporary failure of R. during lactation 20 years ago; recovered perfectly. ? Did hæmorrhages occur at that date.

Case 277. C. 213. Mrs. S., 42.

Atrophy of L. disc with diminution of artery, but vein of good size; no p.l.

History that the eye began to fail 2 months before a confinement 6 years ago. It improved after the confinement, but at each succeeding one it got worse. Quite blind 6 months, and is now nursing a baby.

R. V. = 1 J. Hy. about $\frac{1}{14}$.

ENUCLEATION FOR SYMPATHETIC OPHTHALMIA.

By J. CRAWFORD RENTON, M.B., F.F.P.S.G.

Assistant-Surgeon, Glasgow Eye Infirmary.

Sarah McPherson, æt. 58, was admitted into the Eye Infirmary on June 20th, 1877. She stated that in March last she observed the vision of her right eye failing, and this gradually got worse until by the end of April she was unable to distinguish light and shade. About the middle of May pain commenced and has continued up to the date of her admission.

External Examination.—Well marked sclerotico-choroiditis with staphyloma a few lines posterior to the superior ciliary region. Tension + 1.

Ophthalmoscopic Examination.—Owing to muddy state of lens the fundus cannot be illuminated.

Examination of Left.—Sees No. 2, aided with 14-inch convex glasses; as seen by ophthalmoscope the fundus is congested with a few floating bodies in vitreous.

Various soothing applications were employed, but as the pain continued the staphyloma was removed without stitching on July 7th.

July 10th.—Eye quiet; no pain on pressure.

July 20th.—Patient dismissed, to return in a week.

August 1st.—The eye continues quiet, and patient is able to distinguish light and shade. Examination of left the same as formerly.

August 14th.—Patient returned complaining that the vision of her left eye was beginning to fail. The pupil was found to be irregular and dilated irregularly under the influence of atropine. No pain in right eye.

Enucleation of right recommended with atropine drops for the left, and calomel and opium pills internally.

August 15th.—Globe enucleated under chloroform.

August 18th.—Left pupil dilates freely and regularly. Socket of right healing. Pills discontinued and iodide of potassium substituted on account of a certain amount of haziness in the vitreous humour of left.

September 11th.—Patient sees No. 2, aided by 14-inch convex glasses.

The right eye was hardened in a solution of chromic acid, and on making an antero-posterior section of it, the following appearances were noted:—Superior ciliary region atrophied, with cicatricial tissue passing towards it from the point where staphyloma was removed; retina separated entirely, there being a large quantity of lymph posterior to its lower half, while a partially decolorised clot existed behind the upper half; the lens was degenerated into a softened mass into which blood was extravasated.

My friend and senior colleague, Dr. Thomas Reid, kindly made sections through the ciliary region including in them the cicatrix above mentioned. On examining them microscopically with a low power we observed that the cicatricial tissue had passed into the ciliary processes causing partial destruction of them.

One of these sections is represented in the accompanying wood-cut.



A. Cornea. B. Cicatricial tissue passing into ciliary processes.

During the formation of the cicatrix here delineated the ciliary nerves must have undergone a certain amount of stretching and squeezing, and subsequent to that the nerves in the left eye, possessing the same function and composed of similar nervous substances, were reflexly irritated, and an iritis of the worst form produced. On enucleation being performed, and thus the cause of the irritation removed, perfect relief to the iritic symptoms on the left eye was obtained.

Although it is to be feared from the nature of the original disease that the sight of the left eye will, ere long, suffer still, we cannot ascribe that to the wound involving the ciliary region, but rather to the same conditions which produced mal-nutrition of the right eye.

Irritation of the ciliary nerves is mentioned by most authors as a probable cause of sympathetic ophthalmia, and as the microscope demonstrated such to have been so in the case of Sarah McPherson, I have brought it before the profession.

ON MYOPIA.

By DR. E. LANDOLT, Paris.*

MYOPIA is a subject about which not a little has already been spoken and written. Perhaps, however, the last word has as yet by no means been uttered. My personal experience induces me to adopt views which differ considerably from those which are generally held. I venture to hope nevertheless, that my doctrines may add something to the knowledge we possess of myopia, and thus be a contribution towards its more scientific treatment.

Myopia (short sight) is that condition of the eye in which vision is distinct for short distances only, and in which, for vision to be distinct at long distances, concave glasses are required. This condition arises from the fact that the focus of the dioptric system of such an eye falls in front of the retina. In order that the image of an object may fall upon the retina itself, a condition essentially necessary to distinct perception, the object must be approached to the eye until it actually does so fall.

If the object be at a considerable distance the refractive force of the eye must be lessened by a quantity such that the resulting image shall form itself further back upon the retina. This diminution in the refractive power of the eye is precisely what is obtained by concave glasses.

DEFINITION.—*Myopia is the sign of a disproportion between the refractive power and the length of the eye.*

We may either say that the myopic eye is too long as regards the focus of its dioptric apparatus, or that the dioptric apparatus is too powerful as regards its length.

This disproportion need not be great in appearance in order to produce a degree of myopia tolerably high. Thus I have shown by calculation that each millimetre of increase

* Translated by Dr. Litton Forbes.

in the distance which intervenes between the retina and the focus produces a myopia of 3.3 D. (old system $\frac{1}{12}$). If, for instance, the retina be situated at one millimetre behind the focus of the eye, we have a myopia of 3.3 D.; in other words, the eye for distant vision requires — 12, and can only see clearly at 12 inches. If the retina be separated another millimetre from the focus, the individual will see clearly only at a distance of 6 inches, and will require — 6 or 6.5 D. A separation of three millimetres between the focus and the retina produces a myopia of $\frac{1}{4}$; that is to say, that the individual requires concave glasses — 6 of four inches focus, and can no longer see clearly beyond 4 inches.

When we seek to explain how it is that this disproportion between the length and the refractive power of the eye is produced, we are seeking, in fact, the *cause of the myopia*.

I recognise three special causes of myopia.

1. An eye may be absolutely sound in all its parts; its functions normal, its cornea and crystalline correctly formed, its membranes healthy, and its accommodation perfect, only the whole eye is slightly too long. In other words the focus of its dioptric system is situated in front of its retina, instead of actually upon it. There is nothing surprising in this if we consider the slight increase in length required to produce myopia, and if we further consider that there exists a much greater number of eyes in which, independently of any morbid cause, the focus is situated behind the retina, such eyes being hypermetropic, or having too long sight. Nay, the wonder would rather be if all eyes were so regularly developed that the foci of their dioptric systems always fell exactly upon their retinae.

Eyes which suffer from this form of myopia are not diseased. They are, indeed, to the full as healthy as the eyes of hypermetropes or emmetropes. With the aid of proper correcting lenses, they can distinguish objects at

considerable distances quite as well as normal eyes, and at short distances without the aid of any glasses. Such eyes especially bear close work easier, and for a longer time than normal ones, precisely because by their constitution they are already adapted to short distances, and can consequently see with little or no accommodation.*

The public is possibly better acquainted with this class of shortsighted persons than are oculists. Such persons belong to a class which in youth selects its own correcting glasses, and wears them continuously, perhaps even uselessly, for reading and writing. As age comes on, and the accommodation begins to grow weaker, these myopes use their concave glasses only for distant vision; near objects they see remarkably well without any glasses, whilst normal eyes at the same age have become presbyopic and require convex ones.

This variety of myopia is not, fortunately, so rare as might be supposed from books. But, as I have said, it is characterised by one feature, namely, that the affected eyes present nothing abnormal, either externally or internally. They can see distinctly at a distance with proper correcting glasses, and they also can see near objects without fatigue. This explains why an oculist so seldom has the chance of meeting with such patients. If, however, they do consult him he is struck by the precision of their answers as regards the choice of glasses; unless indeed their myopia happens to be complicated with astigmatism. They will at once single out the glass that suits their myopia, refuse any that are too weak, and still more emphatically any that are too strong. Furthermore, the degree of myopia shown by the ophthalmoscope will generally agree with the glass which the patient has chosen.

This variety of myopia is often congenital. It has little or no tendency to increase. It cannot be cured, that

* They distinguish details which are imperceptible to a normal eye, because they receive larger retinal images.

is to say changed into hypermetropia, which, moreover, for low degrees, would scarcely be desirable.

2. The second form of myopia is due to spasm of the ciliary muscle. In consequence of this the lens becomes more convex, unites parallel rays in front of the retina, and adapts the eye to divergent rays, that is, to objects situated at shorter distances.

This form of myopia is met with chiefly in early youth. Those suffering from it cannot see at a distance, except with the aid of concave glasses. They generally work at near objects, without glasses, and are inclined to bring objects very close to their eyes. Contrary to what is observed in myopes of the preceding category, they complain of fatigue, of a sensation of smarting in the eyes, of headache, and, in a word, of the symptoms of asthenopia. In such cases it is not uncommon to find an insufficiency of the internal recti muscles. When you come to select glasses for these patients, their answers lack precision; they choose glasses that are too strong rather than too weak, even though the former do not improve in any degree their visual acuity.

If we determine the amplitude of accommodation in such an eye, and compare it with the degree of myopia present, it will appear extraordinarily weak, until the determination of the refraction by the ophthalmoscope yields an explanation of the phenomenon. During the ophthalmoscopic examination, the eye relaxes its accommodation, as it does on every occasion when an object is not being fixed (as, for instance, during sleep); then it reveals its true refraction. In such cases we are consequently often surprised to find a degree of myopia much lower than what was apparent from the trial of glasses; nay, we may actually have emmetropia or even hypermetropia.

This form of myopia may be cured by a course of atropine rationally carried out, and combined at times with the use of convex glasses and prisms. I have succeeded in curing many such myopes. I may here cite a

typical case which recently came under my notice. It was that of a youth, aged 16, who had distinct vision for distance only with the aid of D 6, and who, without glasses, could not see any of the large test-types. His myopia had increased with considerable rapidity. He used of his own accord glasses for work, and made marked complaints of asthenopic pains. He was very much alarmed at the idea of his myopia getting progressively worse, as had been the case for some years past. The ophthalmoscope revealed the fact that there was no myopia at all; but on the contrary, rather a slight degree of hypermetropia. A course of atropine was immediately commenced, and the myopia cured. The headaches and fatigue of the eyes disappeared, and at the present time the patient can see at a distance without glasses, and can accomplish near work without fatigue.

Such cases are veritable victories, due solely to the ophthalmoscopic determination of refraction. Doubtless atropisation might have led to a diagnosis, but then it is no pleasant thing for the patient, in order to obtain exact results, to have his accommodation paralyzed during several days, and, as we know, thorough paralysis is essential to a knowledge of the true state of the refraction. Hence, perhaps, an oculist who is unable to diagnose a spasm of accommodation by means of the ophthalmoscope, will scarcely venture, and for good reasons, to propose a course of atropine to his patient. On the other hand, he who has mastered thoroughly the refraction of an eye both when in repose and when fixing an object, and who knows the difference between the respective conditions, may with confidence assure a patient that the symptoms he suffers from will be removed.

3. Myopia may be produced by a disease of the eye, by choroiditis.

The choroid placed between the retina and the sclerotic forms the major portion of the uveal tract (the iris, ciliary body, and choroid). It forms more especially the mem-

brane of nutrition for the eye. Should it become the seat of any alteration, the whole globe may sympathise with it.

Let us review the group of phenomena which characterize choroiditis, an affection which has been with very little reason divided up into different diseases, and called by different names, but which is essentially one disease, exhibiting itself under a variety of forms.

Choroiditis begins by hyperæmia of the choroid, and nearly always of the optic nerve. Then follow exudations under the retina, into the retinal tissues and into the vitreous humour. While the retinal exudations sometimes result in detachment, those into the vitreous become a cause of increased intra-ocular tension, and of opacities. Simultaneously with the above changes there is noticeable an alteration in the disposition of the pigment. From some localities it disappears; in others it is heaped up, in the form of dark-coloured patches. The nutrition of the crystalline and vitreous is thereby impaired; the latter becomes in many cases fluid, as all know who have had to operate for cataract on eyes of this kind; a by no means uncommon occurrence, inasmuch as the crystalline often becomes opaque from this very cause. Similarly and for the same reason, the zonula of Zinn may atrophy in part, and under the influence of the traction exercised upon it as the result of an increase in size of the globe, may be ruptured. In such cases we have a dislocation of the lens, and its escape into the fluid vitreous. Owing to the exudation into the vitreous, intra-ocular tension is necessarily augmented.

But as I have already said, the sclerotic, which is so intimately united with the choroid, participates in the pathological process. Its tissue loses all power of resistance; it yields, stretches, and becomes translucent in parts, as may be seen every day in eyes affected with choroiditis of the anterior portions of the globe, and more especially with cyclitis.

The sclerotic, thus vitally altered, yields to the in-

creased intra-ocular tension. Hence the reason that this increase of tension is seldom revealed by tenometry.

If the choroiditis is seated anteriorly, we have ectasiæ of the anterior portions of the globe; if posteriorly, of the deeper portions of the eye, constituting the so-called posterior staphyloma. The retina covers the staphyloma like a carpet, and necessarily yields along with the other membranes. Now, if the retina was at some former period situated in front of the focus of the dioptric system of the eye, if, that is, the eye was hypermetropic, the hypermetropia in every case grows less in consequence of the displacement of the retina, which has now receded towards the focus. When the retina has arrived as it were actually at the focus, the eye has become emmetropic; when it has passed beyond it, myopic. Such a myopia will be high in degree, exactly in proportion as the choroiditis has developed itself in an eye which was long to commence with. The ectasia of the sclerotic can spread to the equatorial regions of the globe; nay, even to the entire globe. Still, whatever has been the nature of the lengthening process, whether limited to the posterior pole or implicating the entire globe, from the moment that the eye has become longer than the focal length of its dioptric system, it has necessarily become myopic. Thus then we find myopia is, in this case, the consequence of a deep-seated affection of the eye. This myopia will be progressive, because the choroiditis is progressive.

Other and subjective symptoms are not wanting; sensations of tension, especially at the fundus of the orbit, of phosphenes, of *muscæ volitantes*, of diminution in visual acuity. Asthenopic troubles of every kind, even scotomata, may result from this very treacherous affection.

Do not the pathological disturbances just enumerated tally exactly with the symptoms laid down in the textbooks under the head of "pathology of the myopic eye," as peculiarly characteristic of myopia? The anatomy is after all simply that of an eye which has become the

subject of choroiditis, and which may often be myopic, but not always necessarily so. Indeed it is no rare thing to find the same anatomical lesions in a hypermetropic or an emmetropic eye.

In fact the supporters of the current theory, which considers myopia as a specific disease, are not a little embarrassed when it comes to be a question in a hypermetropic eye of explaining the presence of a staphyloma posticum, with pigmental changes at the fundus. To the advocates of the theory such changes are among some of those most characteristic of myopia. According to my view I find nothing surprising in these symptoms. Choroiditis may develop itself in any eye whatever, quite apart from its length or refractive power.

As regards the therapeutics of this variety of myopia, they must necessarily be those of choroiditis. We must, and this is peculiarly important, remove all sources of irritation from the inflamed membranes. We must endeavour, as in all inflammations, to avoid congestion, especially of the head and affected organ, together with excessive light and excessive fatigue of the eye or the accommodation.

The muscle of accommodation, indeed, forming as it does an important part of the uveal tract, may, if unduly or too often put upon the stretch, exert a pernicious influence upon the choroiditis, and thus indirectly become a cause of the myopia. But the accommodation is not, as some have maintained, a primary cause of myopia. Were that the case, then all the hypermetropes who make much greater demands upon their accommodation ought within a given time to become myopes.

It is not the myopia *per se* which, through the medium of the accommodation, leads to staphyloma, but it is rather the accommodation which by aggravating the choroiditis leads to staphyloma with progressive myopia. Therefore it is that in this variety of myopia close work and the use of glasses may become injurious, only, how-

ever, when the latter are too strong, for the distance for which the patient uses them, for then it is that they fatigue the accommodation.

Derivatives of every kind may be considered as indicated in cases of choroiditis, but not of myopia as a rule. Moreover, when it becomes a question of guarding against or curing this particular choroidal form of myopia, it is of the first importance to know the cause or causes of the choroiditis.

Recapitulation.

I recognize three varieties of myopia :—

1. The myopia of an eye perfectly healthy.
2. Functional myopia, due to spasm of the accommodation.
3. Myopia, symptomatic of a disease of the eye, of choroiditis.

The proofs on which I found the explanation I have given of myopia are furnished in abundance, both by clinical observation and by pathological anatomy.

Some of the causes of myopia as given by authors will apply to one or other of the above varieties. There does not, however, exist any uniform and specific cause of myopia, precisely because myopia is not a disease. It is only the sign of a disproportion between the length of the eye and the refractive power of its dioptric system.

An excessive development of the cranium antero-posteriorly, a marked depth of the orbital cavity, may be connected with the first variety. For spasm of the accommodation we must, on the other hand, seek another cause. Fatigue and dazzling of the eye, insufficient illumination, hours passed in unhealthy schoolrooms, a faulty position of the body, the abuse of concave glasses, may all conduce indirectly to the third variety. That is to say, in eyes either predisposed to choroiditis or already attacked by it, myopia may be produced or aggravated by causes similar to the above. Thousands of

eyes, on the other hand, are daily exposed to like influences without becoming myopic, and that because they are not suffering from choroiditis.

If we come to seek out the causes of the essentially progressive or malignant form of myopia, we shall find they are explained reasonably and consistently by the presence of choroiditis. These causes will in the vast majority of cases be of constitutional origin. If we direct our attention to the matter and enquire carefully into the nutritive condition of an individual with choroiditis, we shall often find a condition of low vitality and a feeble and strumous constitution. This applies not only to the individual but to the race. If to this be added excessive and long-continued fatigue of the eyes, choroiditis will become further developed, and may lead to progressive myopia.

ON REFRACTION OPHTHALMOSCOPES.

[From a Lecture, with Demonstrations, at the Berlin Physiological Society,
on the 15th June, 1877.]

By Dr. J. HIRSCHBERG, of Berlin.*

I. IT is well known that Helmholtz, already in his first publication on ophthalmoscopy (1851), has pointed out distinctly that his method (viz., that of the erect image) enables the refraction of the examined eye to be objectively determined (cf. Helmholtz, "Physiologische Optik," p. 176, seqq.).

The original instrument† of Helmholtz does not only appear to us venerable on account of its age and merits, but is also optically so perfect that even to this day we sometimes use it, and could wish that all the inventors of recent instruments had kept that pattern more steadily before their mind's eye. The mirror, consisting of simple, uncoated plates of plane glass, is fixed obliquely so that the visual axis of the observer coincides with the principal axis of the correcting lenses. The latter are few in number, it is true, but large and firmly fixed in a short tube with proper diaphragm; the eye of the observer is well shielded from side-light by a hollow cup-shaped piece at the back of the instrument. In other specimens furnished by the mechanician Rekoss, of Königsberg, the correcting lenses, eight in number, are fixed in two discs which revolve behind the hole.

II. Also the ophthalmoscope of Coccius which was chiefly employed at the clinique of A. von Graefe—a perforated and silvered plane mirror receiving convergent light laterally through a convex lens—enables the observer in the direct

* Translated by Dr. Samelson, of Manchester. It might be well to state that the MS. of this paper was received in August, 1877.

† My own specimen (bearing the date 1852) is marked Luhme & Co., Berlin, Kurstrasse 51, price seven thalers.

method to look vertically through the correcting glasses which are inserted in small frames sliding behind the hole in the mirror. The like advantage belongs to the large ophthalmoscope of Donders.

III. The instrument, which on account of its low price has been mainly used hitherto by practitioners as well as by medical students, is the so-called small ophthalmoscope of Liebreich, a perforated and silvered concave mirror. It suffices for the inverted image, but is not so well adapted for the erect one, since the observer, with an adequate illumination of the pupil, has to look obliquely through the correcting glasses, which are few in number and have to be inserted in a clip behind the sight-hole.

If despite the exertions of some teachers amongst us as well as abroad the use of the erect image has not yet become so widely spread as, on account of the precision and value of the direct method, it ought to be, the fault lies chiefly with the imperfect instruments which are in general use. The sole object of these short remarks is to draw attention once more to the better sort of contrivances.

IV. Great value attaches to the ophthalmoscope of E. von Jaeger, who led the van, with singular success, in the cultivation of the new method and its regular employment in the estimation of the refraction. His mirror, which has been rendered more handy and compact by Mauthner, is devised in strict accordance with Helmholtz's principles. The reflector, of oblique position, consists of unsilvered plates of plane glass; in its place, however, a perforated and silvered plane mirror may be inserted. Thanks to the slight intensity of the incident light the observed eye is not dazzled and is free to relax its accommodation. Thus the position of its far point is more readily ascertainable than with the strong light of a concave mirror. The latter we cannot dispense with in the examination of the inverted and real, aerial image, whilst of the erect and virtual image we obtain an excellent view with a reflector yielding

a feebler light. It must be kept in mind also that the brightness of the retinal image is by no means commensurate with the intensity of the illumination, owing to the contraction of the pupil induced by the latter. Beginners are often surprised to find that they see better when, having before vainly exerted themselves, they are told to lower the flame of the lamp or remove it to a greater distance. As to the number of the correcting lenses, which are inserted after the manner of Helmholtz, and are of adequate size, it varies in the different makes of the ophthalmoscope of von Jaeger. My own specimen* has a spring clip at the back, in which any of the lenses of the trial case may be inserted. This instrument has served me from the beginning of my own practice in all cases up to within two or three years ago. I frequently use it still, and am of opinion that every observer after a little practice will be greatly satisfied with the like. It is true, the empirical selection of the best lens for correction takes some time, but that is compensated for by the great precision of the image and the exact results of the estimation. Cf. Hirschberg, "Beitraege zur Augenheilkunde," II, pp. 13—33, Veit & Co., 1877.

V. Yet, with the increasing number of his patients, everybody has felt the want of a contrivance that should enable him to go on with his work more expeditiously. Hence, within the last few years, there has been produced a large number of so-called refraction ophthalmoscopes, all supplied with revolving discs at the back of the mirror. In other words, the disc of Rekoss, known from the commencement of the ophthalmoscopic era, has come to be furnished with a more copious supply of correcting lenses. A considerable number of different glasses are inserted in one or several discs to enable any observer by a more or less simple rotation of the latter to find the suitable glass for the erect retinal image in any eye to be examined. By such a contrivance, it must be admitted, something more is gained

* Obtained at the price of 17 florins, from the optician Fritsch, in Vienna, Alserstrasse.

than a mere saving of time. The correcting lens, viz., that lens by which the far point of the observed eye is transferred to the far point of the observer's, and also the refraction of the former determined, is, with such an apparatus, both more readily and more reliably secured than with a Helmholtz-Jaeger ophthalmoscope. This is accounted for by the nature of our senses. The quicker the succession of two sensual impressions—*i.e.*, in our case, the same retinal image successively viewed through two different correcting lenses—the safer is our comparison of them.

The first refraction ophthalmoscopes of the kind, furnished with about 24 lenses, were those of Loring, Cohn, von Wecker, and Knapp (1871, 1872, 1873, 1874). They all yield good and prompt results in practised hands, but are not free from partial defects.

1. The mirror in most of them is concave, silvered and perforated in the centre so as to secure an illumination sufficient at once for the inverted image: but so the light becomes too strong for the erect image. If to counteract this we resort to the expedient of lowering the flame or removing it to a greater distance, an undesirable contraction of the illuminated field on the retina is the consequence.

2. When the pupil is adequately illuminated, the observer has to look obliquely through the correcting lenses; thereby their focal distance, calculated as it is for vertically impinging light, becomes changed and shortened, and, moreover, an astigmatic effect is produced. A concave glass of $\frac{1}{20}$ held at an angle of 45° before my own eyes becomes equal in effect to a concave of $\frac{1}{16}$ held straight. This effect of the oblique position increases proportionally with the strength of the glasses, and in the case of the higher powers renders an exact and ready estimation impossible. Again, the astigmatic distortion of the image, which is induced by an oblique position of the stronger glasses, impedes the sharp distinction of the minuter

details and interferes with the objective diagnosis of an existing astigmatism, which is yet of such great importance.

Oblique incidence of the light is lessened in proportion as the illuminating flame is placed nearer to the straight line which connects the centre of the pupil of the observer's eye with that of the patient's, and it ought, therefore, to be behind the head of the latter, to avoid his being inconvenienced by the heat. This purpose appears to be answered by a freely movable bracket, such as is used at the London eye-cliniques, unless we choose to obtain our illumination by a second plane mirror of small size, reflecting the light of a candle, and fixed near to the eye of the patient.

3. The endeavour to accommodate the entire contents of a case of trial glasses upon the periphery of a circle of the length of 25 mm. involves the necessity of resorting to the very small lenses of 2 mm. diameter. But these are very inconvenient, for the following reasons:—*a*. The natural brightness of an object, whilst not essentially interfered with by being seen through a good-sized glass lens, diminishes rapidly as the diameter of the glass becomes less than that of the patient's pupil (or rather that of the image of such pupil as formed by the corneo-aqueous system), that is, in the proportion of the squares of the diameters. When the diaphragms or correcting glasses are of too small size, part of the light employed in illumination goes merely to dazzle the patient without contributing to the brightness of the retinal image under examination. That the homocentric pencils of luminous rays directed to the pupil of the patient become really narrowed in this wise I readily verify by the fact that, with an instrument sold under the name of "Knapp's ophthalmoscope" when I look through the aperture marked 0, I can make out Snellen's C at 20 feet, whilst with my naked eye, being $M_{\frac{1}{11}}$, I can only see CC at that distance.* Dioptric measuring apparatus, however, ought

* Prof. Knapp's own instrument, which he kindly allowed me to use, is free from this defect.

not to be constructed on the principle of the stenopæic aperture (v. Liebreich in Nagel's "Jahresbericht," 1871, p. 161). It is no more appropriate to recommend to beginners a mirror with a sight-hole of only 1 mm., the better to enable them to see the erect image, than it would be to replace the loupe by a dark screen with a fine central aperture. *b.* These small glasses, especially those of high power and in cheap instruments, are but indifferently ground and mounted. From a careful experimental comparison of most of the recently produced ophthalmoscopes I venture to affirm that, with an apparatus which requires the observer to look obliquely through small glasses, it is very difficult, aye, sometimes impossible, to obtain an erect image by a $\pm \frac{1}{2}$ or $\frac{1}{3}$, whereas with a Helmholtz-Jaeger ophthalmoscope the object is promptly and easily attained. It is significant, in this respect, that the two most recently issued Parisian instruments (von Wecker's and Landolt's, by Crêts) do no longer contain any glasses stronger than $\pm \frac{1}{10}$ dioptics, $= \pm \frac{1}{4}$ inch. *c.* Another fault, and that the most telling with beginners, consists in the reflections which occupy one-half or one-third of the field of vision. They are catacaustics springing from the side that happens to be illuminated of the short canal which passes through the mirror and the metal frame. These troublesome reflections may be much lessened by giving that canal a dull blackening with soot in turpentine, which may be renewed at will. But what must be positively insisted upon is, that the canal should be of sufficient width (no less than 3 mm.) and the diameter of the glasses, too, of adequate size. The centre of the mirror may be left unsilvered instead of being perforated, as has been recommended by Liebreich, and observed in the latest Vienna instruments. It deserves to be noted, however, that with continued use the central uncoated portion becomes irregular in outline. I can only say that I have found a small instrument, fitted for the waistcoat pocket, with but 12 correcting lenses of good quality and proper size, which I had made three

years since after the plan of Knapp's, and in which at a more recent period the mirror was placed obliquely, much more convenient and serviceable, both for viewing the erect image and estimating the refraction than a more expensive contrivance with 24 or more glasses of less good quality or position.

VI. As the inadequacy of the small glasses had been repeatedly insisted upon (by Cohn, Knapp, myself), whilst yet certain limits remain assigned to the size of the disc from the configuration of the face, the attempt was soon made to meet these points, without curtailing the series of glasses, by having them fixed in *two discs* revolving upon each other. Thus, by the combination of two different glasses as many as 40, 60, and even 80 different equivalents of correction were obtained. The first who devised such an instrument was Knapp,* and similar are the "metrical" refraction ophthalmoscopes of L. von Wecker and of Landolt.† In the latter the correctives vary by a regular interval of 0·5 from +10 to 0, and from 0 to -10 dioptries. There is in these latter instruments an almost inconvenient *embarras de richesse* for the minor degrees of ametropia, whilst for the higher degrees they are decidedly insufficient. They do not enable the measure of the extreme degrees of myopia or hypermetropia to be determined, which is yet a matter of so much importance in the examination for military purposes. Again, with two discs correct centration becomes a matter of greater difficulty, and the images obtained, especially with the mirror of v. Wecker, are scarcely satisfactory. In his case, to obtain -0·5 dioptric, the two strongest glasses of the apparatus, *i.e.*, +10 and -10·5, have to be algebraically added. More complete, though no better in workmanship, is the ophthalmoscope of Badal, whilst that

* Arch. f. Ophth. and Otol., vol. iii. The instrument is to be had, at the price of 40 dollars, from Gebrüder Müller, 1223, Broadway, New York.

† Both obtainable from Crêtès, 66, Rue de Rennes, Paris, price 40 francs each.

of E. Meyer, of Paris, and a London instrument which I saw there lately at Moorfields, through the kindness of Dr. Gunn, combine greater completeness with superior workmanship. Also, the instrument of Baumeister, in Berlin, is a complete one, and by the substitution of an oblique plane mirror may be freed from those two faults which are admitted by the author himself. It must, however, be allowed that economisation of time and convenience are not amongst the attributes of an instrument which requires re-arrangement at intervals of $\frac{1}{2}$ dioptric somewhere within the range from +14 D to -12 D.

VII. Since I have become convinced by experience that another virtue of the oblique reflector is this, that it enables *beginners* soon to command the erect image, so that with a carefully made instrument of the kind they are even able from the first to discern the upright image, if not to estimate the refraction, my preference is established, although I am far from denying that, with appropriate illumination, equally good results may be obtained by the ophthalmoscope of Knapp, and others of the kind.

Very good ophthalmoscopes, having the mirror thus placed obliquely, and with which I have become acquainted, are the following:—

1. Mr. Couper's, of Moorfields, with a series of discs, and the interval of refraction = $\frac{1}{8}$ inch.*

2. Loring's, improved by Wadsworth, with 24 good correcting glasses of fitly chosen intervals, in one disc, with everything required for the inverted image. This is one of the most elegant of all the ophthalmoscopes that may be considered complete and useful.†

3. Schnabel's, that is, a Jaeger's ophthalmoscope with three revolving discs holding 39 very good lenses in dioptries, and with everything requisite for the inverted image. Brightness of the images, as well as completeness and convenience of the correcting apparatus, distinguish

* Price £7.

† Price 146 marks, at H. W. Hunter's, 1132, Broadway, New York.

this, it is true, as yet somewhat clumsy and heavy instrument.*

A modification of the last-named model is what I recommend as a complete, convenient, and cheap ophthalmoscope, for the use of students and practitioners.

VIII. What we require are from 24 to 36 different glasses ranging, with proper intervals, from $-\frac{1}{2}$ to $+\frac{1}{2}$ or $+\frac{1}{3}$ inch (from -20 to $+18$ D); a lesser number is inconvenient, whilst a larger one is troublesome to manage and unnecessary. 24 glasses (Wadsworth), and even 33 (Knapp), may be satisfactorily arranged upon one disc of moderate size. The object is very skilfully achieved by the reduction of the metallic septa between the several glasses. The workmanship of the American instruments especially excites our admiration; no wonder that they are rather high priced.

Our own pattern comprises two discs, the first holding the following glasses (in dioptries): $+5$; $+4$; $+3$; $+2$; $+1$; $+0.5$; 0 ; -0.5 ; -1 ; -2 ; -3 ; -4 ; -5 ; and the second these: $+6$; $+8$; $+10$; $+12$; $+14$; -6 ; -7 ; -8 ; -10 ; -12 ; -14 ; -16 ; -18 . The discs allow of being very quickly changed, the glasses are readily cleaned. The first disc suffices for the vast majority of cases; for the lowest degrees of ametropia it has the interval of ± 0.5 D.

I. The second disc would then contain the remainder of the above series for the emmetropic observer, omitting perhaps what is superfluous, for instance $+2$ D; $+3$ D; $+4$ D; $+5$ D; $+6$ D; $+8$ D; -10 ; -11 D; -12 D; -14 D; -16 D; -18 D; -20 D.

II. An observer requiring on account of his own ametropia a correcting glass (say of -4 D) for the examination of an emmetropic eye, may have that power for a start inserted instead of zero as the central one, and

* Obtained from Joseph Leiter, in Vienna, at the price of 75 marks. A similar modification of v. Jaeger's instrument had already, in 1874, been made at the direction of Bergh.

the disc further furnished with the glasses +1 D; 0; -1 D; -2 D; -3 D; -3.5 D; -4 D; -4.5 D; -5 D; -6 D; -7 D; -8 D; -9 D. The second disc is required only for the rare cases of high degrees of ametropia.

The apparatus comprises, further, two or three reflectors (*i.e.*, one or two plane and one concave) and two convex glasses (+18 and +12 D, properly ground and mounted) for the inverted image. The concave mirror may be fixed on a separate handle, so that the same eye may be examined for the erect and inverted images without loss of time by unscrewing and refixing.*

After this short review of the instruments, I have still to say a few words on the value of the method, since various authors have raised objections to it and vindicated the preference of the inverted retinal image. On theoretical grounds, as well as from a very extended experience—as I examine every case by both methods—I am bound to differ from that opinion and to adhere to the traditions of the Vienna school (*v. Jaeger, Mauthner*).

Whoever wishes to have a clear insight into the dioptric condition of an eye ought to view the retinal image which is formed by that eye itself as directly as possible, *i.e.*, in most cases the erect image; in cases of extreme myopia the inverted, as seen without correcting glasses. For whenever a strong convex lens (of from 2 to 4 inches focus) is superadded to the dioptric system of the eye under examination, unless care is taken by means of fixed apparatus to minimise spherical aberration and oblique incidence of the light, that lens has a predominating influence upon the character of the image, and the estimation of the independent condition of the eye is rendered difficult. Already in the old classical treatises on optics we meet with the statement, important in practice, that with a convex lens of short focal distance, the inverted images of all objects farther removed from the lens than ten times

* The apparatus may be obtained from P. Dörrfel, Berlin, 46, Unter den Linden, at the price of 40 marks.

its principal focal distance lie nearly in one and the same, that is, the posterior principal focal plane. Hence in the method of the inverted image the unavoidable error would at the least amount to from $\frac{1}{20}$ to $\frac{1}{40}$ of an inch (1 to 2 D), but in reality it is even greater, owing first to the impossibility of securing and maintaining the best position of the unfixed lens; and secondly, to the optic imperfection of the lenses commonly employed, which are mostly left too thick, so that spherical aberration is not sufficiently guarded against.

Professor Schmidt-Rimpler uses for the inverted image the shadow from a crossed grate of metal in front of the flame, as Coccius (Stimmel) does for the erect image. Whilst the flame placed laterally with the grate before it, as well as the eye under examination with a 4-inch convex lens, held about 4 inches in front of it, remain fixed; the head of the observer, with the concave mirror before it, moves gradually backwards, and a conveniently attached tape-measure with a ratch serves to measure the greatest distance (a) between mirror and convex glass, at which the grate's shadow appears distinct upon the retina's image betwixt the papilla and fovea. Hereupon, whilst the flame and the grate continue unmoved, the distance b is measured from the mirror to the locus of the grate's image formed by the concave mirror alone. The distance $d = a - b$ denotes the refraction of the examined eye, since d in emmetropia is equal to f (that is, the focal distance of the convex glass); and it is less than f in myopia and greater than f in hypermetropia.

Having first worked with the original apparatus as described, I then employed a narrower grate, and simplified the method by omitting the second measurement. Being myopic, I have my far point at a fixed distance β ; any one not myopic may render himself so by means of a proper convex glass placed behind the sight-hole of his mirror. Henceforth a only need be measured and the constant β deducted from it, in order to determine d . Upwards of

a hundred careful observations, with a comparative trial in each case of the erect image, have proved that whilst Schmidt's plan can always be easily and expeditiously accomplished, the latter is yet the more accurate of the two, and affords the additional advantage of a considerably magnified image of the most important region of the fundus. And, again, the grate's image formed by the concave mirror held obliquely is astigmatic, *i.e.*, the horizontal and vertical shadow-lines are not at the same time and distance seen with equal distinctness; so that really in every case a mean ought to be struck between two observations. It is self-evident that, under such circumstances, the determination of an existing astigmatism cannot be an easy matter. The less oblique the incidence of the light upon the mirror, the better are the results, as we have seen before. Finally, we must remember that on account of the strong light of the reflector, it becomes rather difficult for the patient to relax his accommodation.

To such a degree, in a comparison of the direct with the indirect method of examination, the former can certainly hold its own. And now it remains in conclusion, to consider the direct method in regard to its absolute value.

Strict philosophical precision and practical utility are two different things.

A. Mathematically, the method of the erect image is not exact itself, since a loupe, whether a compound convex lens or having, like that of Brücke, a concave ocular, is not, in reality, an adequate means for *measuring distance*.* If with a loupe we obtain a distinct image of an object A, we are not able from the known focal distance f of the loupe to calculate the unknown distance a of the object from the loupe, because we do not know to what degree the accommodation of our eye had been relaxed. Hence neither the older nor the more recent attempts, parti-

* It is different with an astronomical telescope, which, if constructed after the plan of my optometer, and supplied with a mirror placed obliquely, will answer the purpose, Cf. Hirschberg, "Beiträge An.," II, 1877, Veit and Comp.

cularly by military surgeons, to utilise the loupe (after the example of Burow), for the subjective estimation of the refraction have been able to secure the approval of ophthalmologists. Yet it certainly makes a great difference whether the eye, looking through the loupe, is that of a recruit or a random patient, or whether it is that of a *medical observer*: for the latter is certainly able, in a short time (say within a few hours, or days, or weeks), to *learn* how to see through a loupe; in other words, to use the ophthalmoscope without any appreciable exertion of the accommodation. If some observers call this in doubt, their isolated experience cannot be allowed to weigh against the overwhelming testimony of others who find that in the repeated examination of the same eye they have invariably to resort to the same glass for correction. A good revolving ophthalmoscope facilitates the examination materially, and I believe the chief cause of dissent to be the imperfect state of most of the instruments still in use at the present time.

B. There is further always this little drawback attaching to the direct method, that we do not adjust for the fovea centralis of the patient's eye, because it is optically too little marked, and also because its being made the point of fixation involves an undue contraction of the pupil. In the method of Coccius (Stimmell) this fault is pretty well guarded against. A convex lens covered with a metal grate is in front of the flame; the incident pencils of luminous rays are rendered parallel, and are by a small plane mirror reflected into the eye to be examined, which, in its turn, is corrected for parallel rays by a glass held as straight as possible in front of it. The general practice, however, is to put up with the flame of an ordinary lamp, and to accommodate for the lateral edge of the papilla, or for one of the fine blood-vessels coursing from the optic disc towards the macula lutea, the bright central lines of which are very readily perceived, or for the ring of connective tissue at the lateral edge of the papilla, or the granular aspect of the fundus (the retinal epithelium)

thereabouts. Now the lateral edge of the papilla is about 3 mm. or 12 angular degrees distant from the fovea centralis, and still it is the refraction of the latter (*i.e.*, its relative position to the principal focal point of the quiescent dioptric system of the eye) which we are seeking to determine. Experience shows that in cases of emmetropia and hypermetropia the error is but very slight, as is confirmed by the controlling trial of glasses for the correction of the atropinised eye (Mauthner, Schnabel, &c.), whereas in myopia, even of moderate degree, the difference is sometimes found to amount to -1 D ($= -\frac{1}{36}$ inch). In cases of ametropia, however, which call for ± 10 or 12 D , or upwards, as *e.g.* in aphakia, the error (0.5 D to 1 D) is utterly insignificant. It is not the absolute, but the relative amount of the latter which requires to be weighed; nor must we lose sight of the fact that, in many disquisitions on physiological optics, the best authors, physicists as well as physiologists, look upon errors, amounting to from 5 to 10 per cent. of the quantity sought, as matters of course. It has no sense, at the present time in our examination of patients, to aim at any greater accuracy. If approximately correcting glasses are supplied in a case of $\text{H } \frac{1}{3}$ (12 D), a slight forward or backward movement imparted to the spectacle-frame suffices to alter the strength of the glass by more than $\pm 1\text{ D}$. It is, therefore, quite unnecessary, so far as the stronger glasses of the refraction ophthalmoscope are concerned, to retain the interval of 0.5 D . Beyond ± 10 or 12 D , it is better for the rapid and sure determination of the proper glass to have the interval $= 2\text{ D}$.

C. In the method here advocated we estimate, it is true, the refraction of the eye for red light, and not for that of greatest brightness, with which, however, ordinary vision is concerned. Badal* makes the difference to be equal to

* Bulletin Mensuel, Avril, 1877. Paris, De la Haye. Such a sentence as this, "Puisque la refrangibilité du rouge n'est pas la même que celle de la lumière blanche composée," should not be allowed to see the light after Newton's discoveries.

0.75 D, but a simple calculation shows it to be no more than 0.25 D, and hence entirely insignificant.

D. In adjusting for the fine median blood-vessels, we determine in reality the refraction of the vascular instead of that of the sentient layer of the retina, the distance between the two being a small fraction of 1 mm. The thickness of the retina between the papilla and fovea is about 0.3 mm. Hence the possible error is certainly less than 0.15 mm., that is, under + 0.5 D, seeing that in the schematic emmetropic eye a distance in depth 0.3 mm. corresponds to a difference of refraction equal to 1 D.

All these trifling errors can only interest us in connection with the question whether such slight deviations from the emmetropic condition are capable of being diagnosed. In cases of pronounced ametropia, they may be left out of account entirely. The conclusion is, then, that in the direct method, pure and simple, we have a secure means of establishing the presence even of an ametropia of ± 0.75 ($\frac{1}{48}$ inch), that is, one corresponding to the weakest glasses of the ordinary trial cases. And this quite accords with our experience that the objective method of determining the refraction for the most part yields more exact results than the subjective, in which we depend solely on the statement of the patient. The former frequently discloses small differences between the two eyes, of which he had not himself become aware in the selection of glasses.

It is necessary, too, to insist that the former is the far more expeditious of the two, and that it is also of much more extended scope, being equally applicable in the cases of children and illiterates, of simulation and amblyopia; and, finally, that it enables the analysis of astigmatism, qualitative as well as quantitative, to be made in the most reliable manner. Yet, for all that, we cannot dispense with the trial case. It is always advisable, wherever it can be done, to superadd the subjective examination. In the search after truth, the methods of inquiry ought to be multiplied rather than restricted.

FOREIGN BODY (PIECE OF STEEL) EMBEDDED CLOSE TO
OPTIC DISC, WITH RETENTION OF PERFECT SIGHT.

By SIMEON SNELL,

Ophthalmic Surgeon to the Sheffield General Infirmary.

George H. Driver, æt. 19, was striking a chisel with a hammer on October 23rd, 1877, when a portion of steel flew off the chisel and hit his right eye. On the 26th, three days later, he came to the Sheffield Infirmary. There was then, beyond a slightly increased vascularity of conjunctiva, no outward appearance of inflammation of eyeball. He had suffered no pain. The pupil dilated fully under atropine. Examined with the ophthalmoscope the media were clear, and allowed a good view of the fundus oculi. Situated a short distance to the outer and lower side (inverted image) of the optic disc and lying on an artery and vein, was a black looking body surrounded with hæmorrhage, a little of which was also between it and the papilla.

There was otherwise nothing abnormal to note.

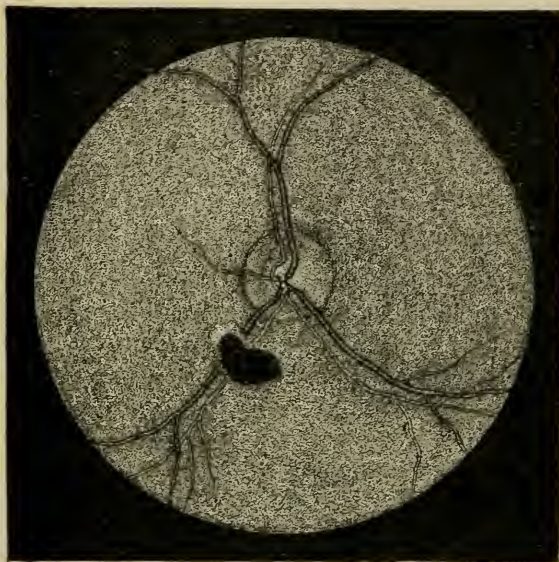
The black looking body, with its metallic lustre, was plainly the piece of steel which had struck his eye, but at what point it had penetrated was not so evident. Examination at first by myself as well as the house surgeons failed to detect any external wound, and it was only by very careful inspection with a magnifying glass that at last a tiny, very faint, horizontal wound, quite closed, was discovered at the inner side, in the sclerotic, a short distance from its corneal junction. His vision was not accurately tested at this time, but it was by no means very defective, and he could see the time by a watch readily enough.

The freedom from inflammatory action in the eye, as well as the condition of vision, rendered any attempt at the removal of the foreign body unjustifiable, which to say the least from its situation embedded in the tunics and its proximity to the "disc" would have been difficult and hazardous. It was decided, therefore, to admit him into the infirmary, and keep a careful watch over him. Except the use of atropine for the first few days, no treatment was adopted. A day or two after admission it was ascertained he could read Jaeger 10.

November 16th.—Made an out-patient to-day.

November 23rd.—Can now read number one of Jaeger's types fluently.

He has attended at intervals since and his sight still remains perfect. At the time of my writing this he says the sight of the eye is equally good as the other. The hæmorrhage has long since disappeared, and the foreign body is seen lying on the artery and vein, with a little white patch of atrophy upon it.



Foreign bodies lodged in the eye, it is well known to those who see much of ophthalmic practice, are among the most perilous of accidents that can happen to that organ. Destruction of sight, with inflammation or frequently sup-puration of the globe are too commonly the result of their presence, to say nothing of the danger the other eye is placed in by them. Occasionally they may become encap-suled, the inflammation subside, and good vision result. Mr. Soelberg Wells relates a remarkable instance of this

sort. I am, however, not able to find a case on record quite similar to the one here mentioned.

The chief points of interest appear to me to be:—

1. The quiet condition in which the eye remained from the first.

2. The freedom from haziness of the vitreous through which the foreign body must have passed.

3. The distinctness with which the piece can be seen.

4. The retention of such perfect sight, rather more than five months having now elapsed since the time of the injury.

In connection with this case I would relate another in which a piece of steel becoming encapsuled in an eye remained there for 29 years without producing sympathetic ophthalmia in its fellow, but for the last 9 years the eye was at intervals the seat of most excruciating pain.

William Wortley, æt. 50, came under observation in April 1875. He stated that 29 years previously whilst “lining” a pair of shears, a portion of the “steeling” flew off and struck the white of the right eye. The piece was about $\frac{3}{8}$ of an inch long, and half of it was embedded in the eye. He applied to a surgeon, who withdrew it. After about two months’ suffering the eye became quiet, but a glimmer of sight remained for two years. For 20 years he had no pain or uneasiness in the eye, but for the last 9 years had had attacks of most excruciating pain over forehead and temple, and in the eye itself. The attacks were attended with an inflamed condition of eye, and lasted for weeks together, preventing him following his employment and each time becoming worse.

When I saw him, the conjunctiva was injected, the cornea was bright, and anterior chamber clear, but a portion of iris was wanting at its lower and outer part—just as if an iridectomy had been performed; there was a scar, also, just beyond the sclero-corneal junction. Tension was normal. The eye could not be illuminated with the ophthalmoscope. There was no sight, not even perception of light.

Beyond a feeling of weakness, the left eye was normal.

As it was thought probable that a portion of the steel might

have remained in the eye, enucleation was advised. He readily consented to lose such a painful organ, and it was accordingly removed, under chloroform.

On examination, the vitreous was found fluid, the choroid atrophied at parts, and a piece of steel about $\frac{1}{8}$ of an inch in length embedded in the ciliary processes. The lens was opaque and black looking.

OPERATIONS FOR SENILE CATARACT AT THE MOORFIELDS HOSPITAL DURING ELEVEN MONTHS.

By A. STANFORD MORTON, M.B.,

Assistant Surgeon to the South London Ophthalmic Hospital.

THE following is a condensed report of 146 cases of senile cataract operated on by the various surgeons of the hospital from December 1st, 1875, to October 31st, 1876, and which came under my care as senior house surgeon during that period. It is completed by continued observation of many of the cases up to August of the present year, and comprises *all* the cases of *senile* cataract (but *senile* cataract *only*) operated on at that time.

After-treatment.—A general outline of the after-treatment may be given in few words. As soon as the operation was completed the lids of each eye were fastened by a very narrow vertical strip of plaster, to prevent involuntary opening of the eyes during recovery from the anæsthetic, then a piece of lint, on which was placed a layer of cotton wool for each eye, and over all the bandage. The eyes were dressed each morning and evening after the operation, being gently bathed with tepid water and the lids oiled with a soft brush to prevent the dressing sticking to them. The patients were kept in bed till the third day, and the lids never opened till the fourth or fifth day after the operation, unless there were indications of mischief. About the end of a week they were handed over to the nurse to dress, and in about nine or ten days were allowed to have their eyes open, but very carefully shaded. Of course, if at any time there was anything amiss, treatment was adopted according to circumstances, but it is not necessary here to enter upon that subject.

The *average duration* of stay in hospital after operation was within a fraction of being 24 days. The *ages* of the patients ranged from 38 to 87.

Anæsthetics were administered for 128 of the operations, chloroform being given in 20, ether in 33, and a combination of chloroform and ether in 75. In 32 of these, there was more or less vomiting or retching after the operation, but no harm appeared to accrue from this accident in any of the cases except one, where there was protrusion of the retina through the wound, with hæmorrhage, shortly after the operation, but as vitreous had protruded before the eye was tied up, it is possible that this was one of those cases of intraocular hæmorrhage after extraction which sometimes occur when there has not been any straining.

Method of Operating.—The operations were performed by 5 different methods, viz.: Modified Graefe 105, Brussels 17, Streatfeild 17, Scoop 16, and Flap 1. With regard to the “modified Graefe,” as performed at Moorfields, the following is a very brief description: the essentials are, 1st. That a Graefe linear knife be employed; 2nd. That the section be made upwards; 3rd. That the section be wholly in the corneal tissue; and 4th. That there be an iridectomy. The details vary slightly, according to the opinion of the operator or the nature of the case, that is to say, the section may be made at the extreme periphery of, or more anterior in, the cornea; the base of the flap may be higher or lower, according to the size of cornea or nature of cataract; and lastly, there are small differences in the method of excising the iris, lacerating the capsule, and removing the lens, not any of them sufficient to merit giving a different name to the operation. In performing the Brussels operation, the puncture and counter-puncture were made with a Graefe’s linear knife at the periphery of the cornea on a level with the upper border of the undilated pupil; the edge of the knife being then turned forwards, the operator cut directly out through the cornea at a point midway between the upper margin of the pupil and periphery of the iris, the capsule being lacerated and the lens removed without an iridectomy. A

solution of sulphate of eserine (four grains to the ounce) was usually instilled immediately to prevent prolapse of the iris. A description of Streatfeild's method will be found in the "Report of the 4th International Ophthalmological Congress," p. 138.

Complications.—The *scoop* had to be employed to complete 4 of the extractions. *Escape of vitreous* occurred during 5 of the operations. *Iritis* supervened altogether in 49 cases; of these 38 led to no more serious result than a certain amount of occlusion of pupil, drawing up of pupillary margin towards cicatrix or adhesion of iris to the scar (the former accident occurring in 8 of the Graefe extractions and the latter in 7 of the Brussels operations). The remaining 11 ended in total loss of the eye operated upon, 8 of these being from panophthalmitis consequent on iritis and suppuration of cornea commencing within a day or two of the operation, and 3 were excised, after some months, on account of long-continued irritation, pain, and increased tension. In addition to the above, there was one eye lost by protrusion of vitreous and retina from retching after the anæsthetic, and another from the patient knocking it during recovery, thus making a total of 13 *eyes entirely destroyed*.

Both eyes operated on at the same time.—In 7 individuals the two eyes were operated upon at once. In one case both were done by "Graefe's modified," while in another both were done by the "Brussels," but the remaining 5 individuals each had the one eye operated on by the "modified Graefe" and the other by the "Brussels" method. The results of these cases were as follows:—In one individual where each eye had been done by a different method, that one on which the "modified Graefe" was performed, had to be excised on account of irritation and pain from iritis and subsequent needling, while in another case where both methods were employed, that eye done by the "Brussels" retained the barest perception of light. The other cases did fairly well, and the one in which the "modified

Graefe" was performed on both eyes recovered with $V. = \frac{20}{20}$ and J. 1 in each eye.

Secondary operations.—For drawn-up pupil, membrane in pupillary area, &c., there were 30 secondary operations, viz., iridotomy 8, needle 20, and iridectomy 2.

Visions.—The vision of most of the patients is that which was taken at date of discharge, but several were taken some time afterwards and many after a secondary operation. In addition to the usual spherical cataract glasses, *cylinders* were requisite in 13 cases. Of the 146 cases, 13 were totally lost, and 6 not having had their sight tested at discharge, on account of irritability of eye, &c., never returned. The vision of the remaining 127 is as follows:—

Vision.	G.	B.	Sd.	Sp.	F.	Total.
$\frac{20}{20}$ and J. 1.....	12	3	2	—	—	17
$\frac{20}{30}$ and J. 1.....	12	2	1	—	—	15
$\frac{20}{40}$ J. 1 to J. 4	7	2	3	1	—	13
$\frac{20}{50}$ J. 1 to J. 6	11	—	—	4	—	15
$\frac{20}{70}$ J. 2 to J. 16.....	10	—	4	—	—	14
$\frac{20}{100}$ J. 4 to J. 16	8	2	3	1	—	14
$\frac{20}{120}$ J. 4 to J. 16	11	2	2	—	—	15
Less than $\frac{20}{200}$	16	5	2	—	1	24
Entirely lost	12	1	—	—	—	13
V. not taken	6	—	—	—	—	6
						146

NOTE.—G. = modified Graefe, B. = Brussels, Sd. = Streatfeild's, Sp. = Scoop, and F = Flap.

These visions are inclusive of those cases on which a secondary operation had been performed, viz., after Graefe extraction 25, after Brussels 2, and after Streatfeild's 3. The above results would have been much more favourable had all the cases which were discharged with capsule, &c., in the pupil returned for the secondary operation.

Two cases appear to be worth recording *in extenso*:—

CASE I was a healthy woman, æt. 57, on whom a Graefe extraction was performed in the L. eye on March 27th, 1876,

and, though a small piece of iris was left entangled in the corner of the incision, recovered without a bad symptom, having at discharge on April 18th V. = $\frac{2}{7}$ and J. 10. On July 27th she returned to the hospital stating that all had gone on well for the 3 weeks after going home, when she "took cold" in her eye. On examination I found the one which had been operated on retained no perception of light, the tension being + 1, while in the R. eye there was bare perception of light and tension + 2, in fact it presented all the appearance of an eye with sympathetic iritis, and was probably caused by the irritation produced in the eye from the portion of iris which, as mentioned above, had healed in the cicatrix. The R. eye was so painful that it was excised, and after suffering pain in the L. till April, 1877, it was excised also. This case is given to show the necessity of removing all portions of iris from the cicatrix during the operation; for, though it is by far the most serious one of the kind which I remember, yet there is often produced long-continued, troublesome irritation from neglecting this precaution.

CASE II is also one of sympathetic inflammation, though of a different nature. The patient was a woman, æt. 58, in very fair health. On April 25th, 1876, Graefe's operation was performed on her R. eye, and it was progressing most favourably when, 10 days afterwards, the same operation was performed on the L., this was immediately followed by pain, œdema, muco-purulent discharge, and partial suppuration of the cornea; these symptoms, however, passed off, leaving her a pupil blocked with lymph and bare perception of light at discharge on June 12th, at which date the V. in the R. was $\frac{2}{7}$ and J. 2. She returned on 11th with bare perception of light and such intense pain in the L. that it was excised, the vision in the R. having at the same time deteriorated to less than $\frac{2}{20}$. On September 1st she again returned with great pain in the R., T + 1, no anterior chamber, the iris in apposition with the cornea, pupil blocked with lymph, and barely counting fingers at 6 inches.

A FURTHER CONTRIBUTION TO THE PATHOLOGY OF INCREASED TENSION.

By W. A. BRAILEY, M.D., *Curator of the Museum.*

THE conclusions arrived at in this paper are based on the examination of all the pathological specimens contained in the Microscopical Collection of the Moorfields Hospital Museum, in which the tension of the eye was accurately determined and recorded at the time of excision.

It comprises 149 cases, among which are included a majority of the cases upon which the preceding paper of the author was founded (R. L. O. H. Reports, vol. ix, part 2). But to these many more have been added, especially within the last year. These most recent cases are the most valuable, because many points, which have since the date of the last paper suggested themselves both as to history and morbid appearances, have been carefully observed. Thus it comes about that, whereas in each of the earlier cases specimens are preserved, showing (i) the Ciliary region by meridional sections, usually both of its upper and lower part, (ii) the Optic Disc with the adjacent Choroid and Retina, (iii) the Choroid and Retina of some part of the periphery of the eye, the more recent cases show not only similar specimens of the Ciliary Region and Optic Disc, but also vertical sections through the Sclerotic, Choroid, and Retina near the periphery of the globe, cut at such a point as to contain also sections through the Long Ciliary nerve and artery in their course forwards. In many of these cases fine sections are also made through the Ciliary region in an equatorial direction, so as to show more minutely its condition, especially with relation to its pigment, epithelium layer, and efferent veins.‡

Besides the morbid anatomical conditions already recorded, there is found in pure Glaucoma cases, almost

without exception, a most important change in some or all of the bloodvessels of the interior of the eye.

This consists in a great enlargement of their calibre, consequent on their dilatation. It is accompanied in the majority of cases by a thinning of the walls, which attains sometimes to an extraordinary degree.

This condition is especially seen in, and indeed seems to be almost confined to the vessels supplying the Ciliary region; and it is much more conspicuous in the arteries than in the veins.

In order to study it, I have taken in all cases the measurements of the *Circulus Arteriosus Iridis Major*, as seen in meridional sections through (i) the upper, (ii) the lower part of the anterior segment of the globe, because this artery seems to be in healthy eyes one of the most constant, in position and size, of the vessels of the Ciliary region. To briefly show that such a change exists, I have computed the average internal diameter and wall thickness of this vessel in the 85 eyes whose tension was increased at excision, two specimens being taken in nearly every case from each eye; one from the upper and one from the lower part of the Ciliary circle. In the same way I have treated (i) 8 normal eyes prepared under precisely similar circumstances, in order to serve as a standard of comparison; (ii) 22 diseased eyes, with normal tension; and (iii) 34 diseased eyes whose tension was diminished.

A comparison shows a marked difference in these respects between increased, diminished, and normal tension, thus:—

Eight normal; av. diam. of art., $\cdot 0253$ mm.; av. wall thickness, $\cdot 0073$ mm.; av. thickness of cil. muscle, $\cdot 685$ mm.

Diseased eyes, with normal T at excision; art. $0\cdot 274$ mm.; wall, $\cdot 0085$ mm.; muscle, $\cdot 57$ mm.

Diseased with $-T$; art. $\cdot 0214$ mm.; wall, $\cdot 0082$ mm.; muscle, $\cdot 675$ mm.

Diseased eyes with $+T$; art. $\cdot 0405$ mm.; wall, $\cdot 0048$ mm.; muscle, $\cdot 411$ mm.

This difference would be much more strikingly expressed in figures if the sectional area of the artery were computed instead of the diameter only.

When, however, the cases with + T are further examined, it is found that they can be divided clinically into several groups, in some of which the arterial changes especially are much more striking than in others.

Taking, in the first place, the 27 cases in which the Glaucoma appears from its symptoms and history to be a primary disease, that is to say, Glaucoma uncomplicated by any previously existing morbid condition, or any markedly recognizable accompanying inflammatory lesion, I find in them the average diameter of the Circulus is .04686 mm., and its average wall thickness, .003185 mm. They thus exhibit a still larger excess in diameter and a greater deficiency in wall thickness, as compared with healthy eyes or diseased eyes with T either normal or minus.

Examining still more fully this group of 27 cases of pure Glaucoma, I find this enlarged and thinned condition of the Circulus to be totally unrecognizable in one case (No. 303, cited below), and in nine more it is visible at one part only of the Ciliary circle, being absent from the upper part in seven of these cases, and from the lower part in the remaining two. Even the total exception will be seen hereafter to have the Long Internal Ciliary Artery dilated and thinned, in its course forwards, to a very extraordinary extent: thus, though one more of the cases shows but moderate dilatation and thinning either in the upper or lower part of the Ciliary region, it is clear that this condition is a very constant one in uncomplicated Glaucoma.

I may here remind my readers that this arterial ring forms an anastomosing circle in the anterior part of the Ciliary body near the base of the Iris. It is made partly by the Anterior Ciliary Arteries which issue from the Recti Muscles, and perforate the Sclerotic in front of the insertions of these, but principally by the two Long Ciliary Arteries which also form further back in the muscle a second

anastomosing circle, less constant, however, in position and size. From the *Circulus Major*, branches are given off to supply the Iris and Ciliary Muscle. The venous blood escapes principally through veins running from the Ciliary body into the veins of the anterior part of the Choroid. It finally escapes from the globe in company with the venous blood of the Choroid by the *Venæ Vorticossæ*.

That this pathological condition is sometimes found at one part only of the Ciliary circle appears so extraordinary, that I have of late examined the Long Ciliary Arteries in their course forwards through the Sclerotic, with a view of determining whether they are also involved in it. I regret that it is only within the last year that it has occurred to me to do this, so that I have specimens from comparatively few cases. Moreover, this examination is attended with some difficulty; for unless the sections happen to show the artery as it bores its way obliquely through the Sclerotic, it is difficult to recognize it with absolute certainty; and even when it is recognizable in its scleral tunnel, its non-enlargement may be attributable to the immediately surrounding Sclerotic yielding or being absorbed very gradually.

Such measurements of the Long External Ciliary Artery show that its average scarcely exceeds either the average measurement in healthy eyes or in diseased eyes with normal T, and the same, generally speaking, is the case in regard to the Long Internal Ciliary.

For although about half the cases present some enlargement and some thinning, yet the degree of this, with a few striking exceptions (see No. 303, page 395), is not so great as that seen in the *Circulus Major*.

In the remaining cases the average is even below the normal, perhaps owing to increased pressure of the Sclerotic on the artery in its oblique course through it. Such pressure would have a contrary effect on arteries perforating vertically.

In 12 cases of this group (Group I) the average measurements are :—Long Internal Ciliary, diam., $\cdot 0478$; wall

thickness, $\cdot 0132$ mm. Long External Ciliary, diam., $\cdot 045$; wall thickness, $\cdot 0147$ mm. In two healthy eyes the measurements are:—Internal Ciliary, diam., $\cdot 047$ mm.; wall thickness, $\cdot 017$ mm. External Ciliary, diam., $\cdot 035$ mm.; wall thickness, $\cdot 017$ mm.

The enlargement of the arteries appears to be a primary condition, preceding in time even the atrophy of the Ciliary Muscle, for it is found in some cases of Glaucoma of short duration, accompanying a fairly developed muscle. (See Cases Nos. 101, page 396, and 177, page 394.)

It might be thought to depend on an obstruction to the exit of blood from the eye through the choroidal veins, due either to pressure on them generally, or to compression of the *Venæ Vorticosæ* during their passage through the Sclera. But strongly in opposition to this idea is the fact, that this enlargement is limited to one region in so many cases, and when we come to examine the next group of cases, we shall find some striking instances of this.

A comparison of the arterial measurements previously recorded shows, in addition to the enlargement, a very considerable diminution in the wall thickness.

This is important, because in long-continued enlargement of an artery consequent on increased nutritive activity of the parts supplied by it—as for example in inflammation or tumour growths—the wall thickness would be gradually increased in proportion to the increased calibre.

But in Glaucoma, though a certain amount of thinning is due, without doubt, to simple enlargement in capacity, yet beyond this the walls themselves atrophy. This is proved by a comparison of the most recently affected eyes with those whose disease is of long duration. In some, indeed, the wall thickness can scarcely be measured, and no structure can be made out microscopically beyond a basement membrane and a few nuclei.

This condition is something special to Glaucoma, for it is not found in eyes with long standing disease accompanied by normal or minus T (see Groups VI and VII),

unless there has been previous Glaucoma, as evidenced by the history, or by the state of the Optic Disc and Iris.

An examination of 4 eyes, formerly glaucomatous, though their T has now fallen to normal or minus, reveals this thinning in 2, though the arteries are now of normal size, their average diameter being $\cdot 03$ mm., and their wall thickness $\cdot 0025$ mm. In the third case the arteries are extremely small, and the walls in comparison fairly thick. In all three the muscle is extremely atrophied, and the Iris periphery adherent to the Cornea. In the fourth case there is recorded only a short attack of + Tension, accompanied by severe pain. Here the artery is of normal size and wall thickness at the time of excision, and the Ciliary muscle is well developed.

I have no observations of any value to record as to the condition of the Anterior Ciliary Arteries in their passage through the Sclera, but it is a matter of clinical observation that these are in some cases enlarged in their course on the exterior of the eyeball. I should infer, therefore, that the Long Ciliaries may be affected also exterior to the globe. Naturally the enlargement is not restricted to the Circulus Major, but often the whole anterior part of the Ciliary muscle is rendered completely cavernous by dilated blood spaces, which appear to be principally arterial. In my former contribution I mentioned these blood spaces as existing in the Ciliary region, but I incorrectly supposed them to be enlarged veins.

As far as I have examined the efferent veins of the Ciliary region, my impression is that they present no enlargement at all corresponding to that of the arteries, but further inquiries in this direction are needed.

I can say nothing as yet about the Short Ciliary Arteries, for their investigation is attended with difficulty on account of their number, small size, and mode of perforating the Sclera. I have no measurements either of the Venæ Vorticosæ or the Retinal vessels.

The ophthalmoscope shows that the Retinal arteries are

early diminished in size, and that this is ultimately the case with the veins also. There is sometimes an aneurysmal condition of the smaller retinal vessels. Hæmorrhages into the Vitreous or Retinal substance are not uncommon. I have no reason to think any of these changes to be in any degree the cause of an increased tension.

In conjunction with the vessels there may appropriately be discussed here another pathological condition, found sometimes in Glaucoma, and, as far as I know, peculiar to it, which is, without doubt, consequent on the implication of the Long Ciliary Arteries in the above-described glaucomatous changes.

This consists in a thinning of the Sclerotic in the course of the External and Internal Long Ciliary Arteries and Nerves. It is usually seen as a wide bluish-black streak extending forwards in the Sclerotic from their point of entrance on either side of the Optic Disc up to and sometimes beyond the equator. Sometimes the bluish area is so extensive and so thin that it makes an actual staphylomatous bulging.

This condition was present on the inner side in 7 out of 12 cases of Group I, and microscopical sections show in 6 out of the 7 an enlargement and thinning of the Ciliary Artery corresponding to it. In the 7th the condition of the artery remained undetermined from imperfect observation. The average diameter of the Long Internal Ciliary in these 6 cases is $\cdot 064$ mm., and its average wall thickness $\cdot 01$ mm., as opposed to $\cdot 032$ mm. diameter and $\cdot 015$ mm. wall thickness in the five eyes not staphylomatous in this place. The average normal measurements are $\cdot 047$ mm. and $\cdot 017$ mm. respectively.

Staphylomata are less frequent on the outer side, but where they occur they are accompanied by a corresponding change in the artery.

In the centre of the thinning is found the enlarged artery, and in the more marked cases the Sclerotic there is loose in texture; its fibres are attenuated and irregularly

disposed, and among them are a few scattered nuclei. Where there are actual bulgings the structure of the Long Ciliary nerves is almost totally destroyed.

The thinning begins where the artery approaches the inner scleral surface, and in this position there may be only an abnormally deep groove for its reception, whereas further back the Sclerotic is scarcely affected.

With one doubtful exception, no other Scleral Staphylomata are visible in any cases of this group, nor any Ciliary Staphylomata, whether corneal or scleral. I am of opinion that local scleral thinnings other than in the course of the Long Ciliary Arteries are only found where there has been Choroiditis or Cyclitis, and that they are absent, therefore, where Glaucoma is a primary disease.

Leaving the arteries and passing to the condition of the Ciliary muscle; the measurements already given show that the average muscular thickness of all the cases with +T is less than in diseased eyes with T normal or minus, and also less than in healthy eyes.

This is more markedly seen if we consider only the group of pure Glaucoma cases (Group I). In these the average muscular thickness is $\cdot 35$ mm., the greatest bulk being, on the average of the two sections, $\cdot 5$ mm., and the least $\cdot 2$ mm. The additional cases now examined confirm generally what I said in my former paper, except that I am now satisfied that the extent of the atrophy depends on the duration as well as on the acuteness of the disease.

This atrophy is not preceded by any considerable increase in the nuclei of the muscle. In one case of 10 weeks' duration quoted below (No. 177), the first change appears to be that the muscular fibres have their structure indistinct, with, possibly, a slight excess of nuclei round them. But far more frequently the specimens show even fewer nuclei than usual. And, just as in the Iris, the cases with greatest nuclear increase are far surpassed by many with T normal or minus.

That the atrophic change is not due to the pressure of

the increased contents of the globe is evident from the fact that in two of the cases of uncomplicated Glaucoma the atrophy is confined to one part of the Ciliary circle, the lower in each, passing upwards from which the muscle gradually improves till the opposite upper region, where it is nearly normal. But it appears to be partly wanting, to say the very least, in the cases of shortest standing; for instance, in one with a history of 10 weeks, the muscle is .45 mm. thick, and its texture is good; and in another of 5 months' duration it has moderate texture, though it is only .38 mm. thick. Therefore I judge that it occurs second in point of time to the arterial changes.

It is interesting to observe that the muscle undergoes the earliest and greatest atrophy at its antero-internal part, the region where an enlarged artery (the *Circulus Major*) is most commonly found.

This gives the idea that the atrophy may be the direct consequence of the vascular change. That dilatation occurs in several cases, especially in the Group next to be described, without atrophy, is not inconsistent with this explanation, if we suppose it to have recently come on.

But, after all, the most reasonable supposition seems to be that they are due to a common nervous influence. Thus they will start simultaneously, but one will be obvious far more quickly than the other.

This is supported by one case (No. 303, see page 395), which shows no dilatation of the *Circulus Major*, either above or below, notwithstanding that the Long Internal Ciliary is remarkably enlarged and thinned. In it the muscular structure, though averaging .42 mm., is decidedly thin, both in the upper and lower ciliary region. I must note, however, in view of what will be said hereafter on the subject of Iridectomy, that a good Iridectomy upwards had been done two weeks before excision, though without effect on the Tension.

I come to the conclusion, therefore, that though the muscular changes are very constant and very marked, yet

that they are less frequent than the arterial dilatation, even in such long standing cases as require to be excised, and that, had I an opportunity of examining cases at an earlier period of the disease, this muscular atrophy would be met with in various stages of development. Apropos of this, will be noted the comparatively small bulk of the muscle, though its structure is good, in the cases of short duration above referred to.

Some further evidence on these important changes, both muscular and arterial, will be offered when we come to consider the other groups of cases with +T, especially those in which eyes containing tumours have become glaucomatous (Group III), and those where some slight accident has been the starting point of the Glaucoma (see Group II).

An analysis of all the cases with increased tension (Groups I—V) shows that the periphery of the Iris is very commonly applied to the adjacent corneal margin. In fact only 9 out of the entire 86 have the Iris periphery free both above and below, and, therefore, presumably all round. But there are also, including the iridectomized eyes in which +T has returned, 11 cases in which the Iris on one or other side is perfectly free, making 11 partial and 9 perfect exceptions to the general rule that the Iris is applied to the periphery of the Cornea.

Of the 27 cases of Group I, the Iris is free both above and below in only 2 cases, and free on one side in 1 case more. This application is then a very constant condition, much as the changes in the muscle and arteries.

But an examination of Group VI (with Tn) and Group VII (with -T) shows that this condition, though rarer than in Group I, is still frequently met with. For in Group VI the Iris is adherent on both sides in 5 cases out of 21, and on one side only in 2 more. And in Group VII on both sides in 12 out of 34 cases, and on one side only in 4 more. I have a case with partial peripheral adhesion, from a very long standing perforating wound, in which the

Tension has never been increased. And in cases of old Glaucoma with falling Tension the adhesion must still remain. Clinical observation of Glaucoma eyes shows that at an early period of the disease the pupil is sometimes mobile and the Anterior Chamber exists all over. Moreover in Group I there are 2 cases (see No. 177) in which the Iris is merely applied to the corneal margin and not adherent. These constitute strong reasons for considering this adhesion secondary to the +T. It may be a cause of maintaining it; but any influence it exerts in this direction will be better considered together with the cases in which the pupil is excluded. The applied base of the Iris presents in a majority of the cases of pure Glaucoma some slight inflammatory appearances. An excess of nuclei is seen in its structure, and usually also on its anterior surface, or between it and the Cornea. It is probably on account of this pre-existing inflammation that the adherent Iris base is frequently totally atrophied. The existence of past inflammatory changes is occasionally indicated by a rolling of the Iris on itself, either forwards so that the uveal pigment becomes visible on the anterior surface as a narrow zone extending from the pupillary edge, or as a broader one in more severe cases; or it may occasionally be rolled backwards, in which case no pigment zone is visible, but the Iris limb becomes shortened all the same.

But this Iritis is rarely extensive or acute. It often cannot be recognised during life. It is also wanting where the Iris is free, and therefore it is probably a consequence of its altered position.

Where Iritis is a cause of +T, as, for example, in Iritis Serosa, the Aqueous Humour is increased, whereas in this Group it is usually diminished. If further confirmation were needed as to the want of connection of the Tension in Group I with the Iritis, it would be found in the fact that the Iris has passed into an atrophic condition at the time of excision in many of these cases.

In close relation with the application or adhesion of

the periphery of the Iris to the corneal margin, comes the condition of Schlemm's Canal, which is important as having had attention directed to it by so distinguished an author as de Wecker, as furnishing a cause of increased Tension.

Taking, as before, microscopical sections from two regions of each of the eyes with +T, in which the observation is recorded, it is completely closed in 50 of them. But it is large in 19, of moderate size in 39, and barely visible in 61 others. It is only in 15 of these cases that closure occurs in both parts of the ciliary circle under observation.

Still this does not represent adequately the facts, for in every case in which the Iris periphery is in contact with the Cornea, though the canal of Schlemm exists, its use as a means of escape of fluid from the eye, if such be its function, is nullified. And indeed we find only 8 cases in which the Iris is free both above and below, and Schlemm's Canal open at the same time. Thus the condition of this canal seems to be of great importance. And its importance appears to be strengthened by a consideration of Group I, which contains only 2 cases with Iris free, and canal of Schlemm open at the same time in both parts of the ciliary region examined.

But an examination of the diseased eyes with normal T (Group VI), shows it to be obliterated both above and below in 5 cases out of 19. And Group VII(-T) contains 4 similar cases out of 34, as well as 6 in which the closure is on one side only.

Moreover, one of the cases of Group VII has the lower limb of the Iris so thickened by a sarcoma growth, that it extends almost close to the Cornea. The canal of Schlemm also is surrounded, and almost blocked by tumour cells. In this case, notwithstanding that any escape of fluid by this channel would be impeded, the Tension was slightly diminished.

None of the cases of Group I show any connection

between the condition of the Optic Disc, considered as a means of escape of fluid from the Eyeball, and the Tension.

The Pars Ciliaris Retinæ, and the Retina itself next demand a short notice. In Group I the Pars Ciliaris is either unaltered, or it has undergone a degenerative change.

In the great majority of its cases (about $\frac{4}{5}$ ths), there is a change in the columnar cell-like elements of this region, their internal ends are enlarged, and contain several large round nuclei, instead of the single small one usually found normally. Thus each element may become pear-shaped in outline. The fine fibrils emerging from between them can be more distinctly seen, as they lie between the narrow parts of the pear-shaped elements in the first part of their course towards the suspensory apparatus of the Lens. Generally also the fine lamina which covers the internal surface of the Pars Ciliaris can be seen to be raised up, except at the points where fibrils from the Pars Ciliaris enter it. Thus is formed a series of arches over the pear-shaped ends of the columnar elements of the Pars Ciliaris, as is seen in equatorial sections of this region.

But I find this condition to exist in some senile eyes that are not glaucomatous, and therefore, though I have not had full opportunity of investigating the matter, I think that these changes have nothing to do with originating increased tension.

The Retina shows a cystic condition of its most anterior Zone in about half the cases of Group I in which this region came under inspection. But I have also found it in many with normal T, and therefore I must exclude it also as a cause of Glaucoma.

I can detect in the rest of the Retina no changes in the structure of its elements that seem distinctive of, or even very common in, Glaucoma. The blood-vessels are always affected in the latter stages, as has been previously described.

In not one of the cases of Group I is there any inflammatory change in the Choroid, nor am I able to point out any distinct vascular change. Any variations in the Retinal pigment epithelial layer tend rather in the direction of atrophy, for in several instances it presents slight Colloidal changes. The pigment epithelium of the Zone just posterior to the Ora Serrata is often degenerated so as to constitute an irregular, darker coloured Zone, finely speckled with grey. I think that this appearance corresponds to where the Retina is in a cystic condition, and is that which has been described by Dr. Fuchs, as seen with the Ophthalmoscope. Microscopic examination, however, does not lead me to consider it to be due to present or past inflammatory changes.

The Epithelium covering the posterior part of the Ciliary processes is somewhat lighter in colour than usual, forming a series of brown radially-disposed stripes, alternating with the darker ciliary folds.

Some change is noted in the Vitreous in nearly every case of Group I. In most it had a slight yellowish tinge, while a few contained recent blood extravasations. In the cases of shortest standing, its consistency was not far from normal, though when cut into, more liquid than usual drained away from it. In those more advanced almost the whole Vitreous escaped as a syrupy, yellowish fluid. In several cases in which the Vitreous was somewhat more consistent it separated readily from the Retina at the posterior part of the Vitreous Chamber, to which it seems to have been only loosely applied.

In most cases the increase in volume to which the Tension is due is within the Vitreous Chamber, judging from the *post-mortem* position of the Retina, Lens, and Iris.

But there are several cases in which the Retina is detached into loose folds. In these the Vitreous and fluid must actually be diminished in bulk. This accumulation of Sub-Retinal fluid appears to bear no relation to the

enlargement of the Long Ciliaries. And even if we suppose that fluid has transuded from the dilated Ciliary Arteries into the meshes of the Vitreous, that will furnish no explanation why it should occasionally be found under the Retina.

The Sclerotic presents no special rigidity in Glaucoma. True it is often thick and firm in the cases of Group I, but not more often than is the case with normal eyes of the same refractive condition, and at the same period of life. With a rigid and unyielding Sclera, however, as in senile and hypermetropic eyes, the effects of +T become more rapidly expressed and more destructive.

The ocular conjunctiva is generally very thin in these cases. My observations as to other points, such as the condition of the Optic Nerve Sheath and the Optic Nerve itself, simply lead me to a negative conclusion as to any effects produced by them on the Tension.

Three interesting cases illustrative of Group I are here cited, one of old standing, one recent, and the third showing an exceptional condition of its Circulus Arteriosus.

No. 289. Rebecca D., æt. 66, widow. Two years ago, after severe mental shock, acute pain came in the top, back, and sides of her head; it extended to the left temple also, where it was accompanied by a continuous beating sensation. Six weeks later both extended from the temple into the left eye, and the sight was dim. A month later the sight became much worse after a violent vomiting, lasting an hour. Till a year ago she retained perception of light. She has worn glasses for reading for 41 years. The *right* has T 2, V. = $\frac{2}{200}$, h.m. = 2.5 D., with which V. = $\frac{2}{40}$ fairly. *Left* at excision: Globe small; pupil dilated and fixed. Lens cataractous; T 2. There is a broad black band, 3 mm. wide, along the course of the Long Internal Ciliary Artery, reaching as far forwards as the Rectus Internus insertion.

Equatorial Section.—Retina detached, except from O.D. and Ora Serrata, in loose folds. There are scarcely any traces of Vitreous in its cavity. Sections of the upper Ciliary region show the Iris somewhat inflamed, its base adherent to the Cornea, its pigment rolled forwards slightly into view by the contraction of

its anterior surface. The Canal of Schlemm is barely visible. The Ciliary muscle exhibits no excess of nuclei, but an extremely atrophic structure. Its thickness is $\cdot 34$ mm. The Circulus Arteriosus Major is enlarged, internal diam. = $\cdot 06$ mm.; its walls are thinned, $\cdot 003$ mm. The anterior part of the muscle is quite cavernous with dilated blood spaces. There is some degeneration of the Pars Ciliaris Retinae. The anterior part of the Retina is a little cystic.

The Ciliary region below is much as above, except that the Iris apex is atrophied, and its base presents only a slight excess of nuclei.

Vertical section of the inner periphery shows the Choroid about normal, the Sclerotic thinned and bulged outwards, the Long Ciliary Artery somewhat enlarged; diam. = $\cdot 056$ mm.; walls rather thinned, = $\cdot 013$ mm. Nerve almost totally destroyed.

Similar sections of the outer periphery show much the same, but there is only slight dilatation of the Artery, and no Staphyloma.

The Optic Disc presents a moderately deep, universal cupping.

No. 177. Eliza R., æt. 79, widow. Ten weeks ago she could read ordinary print by the aid of $+5$ D. Then there came every now and then a slight beating and throbbing, like a gathering at the back of the *R.* eye and in the head. The eye was dim a little at these times, though generally she could see as well with it as before. Seven and a half weeks ago, after a violent attack of vomiting, acute pain seized her in the *R.* eye, the *R.* side of head as low as the Malar bone, and bridge of the nose. The skin of these regions was so tender that she could not bear to touch it. The pain continued growing worse and worse till excision. She last saw light three weeks before excision. The eye is much bloodshot. T 2.

The *left* has never pained or troubled her. V. = $\frac{2}{7}0$; with $+1$ D, V. = $\frac{2}{4}0$; with $+6$ D. she reads Jæger 1. Tension normal.

Equatorial section of *right*. Ch. and Ret. *in situ*. Vit. about normal in consistency; in it are one or two small hæmorrhages near the Retina. The Lens contains some peripheral, opaque striæ.

In Upper Ciliary region, muscular thickness $\cdot 5$ mm., antero-internal part well seen; fibres fairly bulky, though their structure is somewhat indistinct, and there may possibly be a slight excess

of nuclei around them. Circulus Major partly collapsed; diam. $\cdot 045$; walls, $\cdot 003$. Canal of Schlemm of moderate size. Pars Ciliaris shows degenerative changes. Adjacent Retina not cystic.

The Lower Ciliary region is much the same, but its Circulus is rather larger, = $\cdot 052$, and its walls thinner, $\cdot 002$ mm.

The Long Ciliary Arteries are not enlarged, and there is no Staphyloma corresponding to them.

The Optic Disc exhibits a universal shallow shelving cupping.

No. 303. William F., æt. 80. For seven years he has worn spectacles for reading. Twelve months ago both eyes came dim. Six months ago both watered constantly, and on shutting up the *Left*, he found that the *Right* had only perception of light. It has been painful six weeks. *Three weeks before excision* the *R.* still retained perception; its anterior chamber was deep; media hazy; T 3. *L.* field good. O.D. cupped and atrophied. T normal. Iridectomy upwards was done in each eye.

The *R.* remained tender and painful till its excision. Its anterior chamber re-formed slowly. Its tension returned. The T in the *Left* was relieved.

R. globe normal in size. There is a broad black streak along the course of the Long Internal Ciliary Artery, reaching as far forwards as the Rectus Internus insertion.

Equatorial Section.—Ret. and Ch., *in situ*; Vitreous, thin, syrupy, yellowish. There are many small hæmorrhages in it below.

Upper Ciliary Region. Iris limb entirely deficient above; there are no traces of any adhesion to the Cornea. Cil. Muscle: thickness, $\cdot 34$; structure thin; Circulus, normal in size = $\cdot 02$; wall thickness, $\cdot 0055$ mm. Canal of Schlemm just visible. There is some degeneration of Pars Ciliaris Retinæ as in the last case. Adjacent Retina not cystic.

Lower Ciliary Region, much as above, but Iris present with its periphery well away from the Cornea. There are large hæmorrhages between the posterior part of the Ciliary Muscle and the Sclerotic.

Vertical Section of Inner Periphery shows the Long Internal Ciliary vastly enlarged. Diam. = $\cdot 095$. Walls extremely thin, $\cdot 002$ mm. The fibres of the adjacent Sclerotic are a little thinned and separated, and there is much blood extravasated among them.

The Outer Periphery has its artery unaffected.

The Optic Disc shows a shallow shelving cup, extending right up to its margin.

GROUP II.

Standing next to the Uncomplicated Glaucoma Group are 13 cases, which in their pathological conditions are almost identical with pure Glaucoma. But these have had their plus Tension preceded by some injury or disease, which has probably been indirectly the starting point of the Glaucoma. In all of them, however, this condition has either long ceased to be active, or it is very slight, and of a nature not usually associated with plus Tension.

This group of cases is, however, in some respects even more important than Group I, because the previous morbid condition has not only rendered the duration of the disease more precisely determinable, but its existence has made both patient and surgeon agreeable to an earlier enucleation than would otherwise have been the case. Moreover, in several of them this exciting cause has been localized in one part of the Ciliary circle.

The average Ciliary muscular thickness in this Group is .423 mm.; the average diameter of the Circulus, .057 mm.; and its average wall thickness, .00342 mm. Thus in these respects the group resembles pure Glaucoma, though in size of the artery it actually exceeds it. But the muscle, on the other hand, is not quite so much atrophied, and this I connect with the rather shorter average duration of the cases. The same remark applies to the wall thickness, as both these atrophic changes appear to be gradual ones. But the arterial enlargement I consider to be a very rapidly occurring change, and in connection with this the condition of the artery in the following case belonging to this group may be noted.

No. 101. The patient was a man aet. 76. He has a myopia of 6 D. in his *Right* eye, together with some nuclear opacity of the Lens. In other respects it is normal. His statement shows

these conditions probably to have existed in the excised eye also.

Fourteen days before the excision a sharp fragment of iron struck him in the *Left* eye, perforating the Cornea close to its lower and inner margin, and at the same time dislocating the Lens, which remained hanging loosely from its upper and outer attachments. The Iris prolapsed a very little way into the perforation thus formed, and plugged it at its internal orifice. He was able to continue at his work. About a week later the eye began to be painful, and continued violently so till excision.

At the Ciliary region furthest removed from the wound, the Circulus Major has a diam. of .055 mm.; its walls are thin, though their limit is difficult to define. The Iris is not inflamed, and its periphery is widely removed from the Cornea. Other conditions are as on the side near the wound, where the Artery also presents just the same enlarged and thinned condition. The Ciliary muscle measures .62 mm., and is well developed. Its antero-internal part slopes backwards from its origin, so that the circular fibres are either partially deficient or else their direction is altered, making them inconspicuous. This may possibly have some connection with the myopia. There is scarcely a trace of inflammatory change anywhere, even in the Iris close to the prolapsed portion. The Canal of Schlemm is wide open, even where it is close to the prolapsed part of the Iris.

The Vitreous is a trifle fluid. The Lamina Cribrosa is slightly pushed back. The Long Ciliary Arteries were not examined. In all other respects the Eye was normal.

In conjunction with this may be cited another very important case in which the injury was confined to the upper and anterior region of the Sclera. The muscle in this neighbourhood was partially atrophied, and the Circulus Major dilated, whereas below both were of normal size.

No. 352. Mary W., æt. 38. Six months before excision a fragment of glass from the bursting of a mineral water bottle penetrated the Sclerotic of her *Left* eye, $\frac{1}{4}$ inch behind the upper corneal margin. No fragments remained in the eye. A suture was inserted, and she remained 3 weeks as in-patient at this hospital. At her discharge the fundus was not visible, but there was

red reflex as if from large blood clots near the wound. The T. was normal. Bare perception of light remained. There were no other symptoms.

For about 13 weeks the eye seemed no worse, but then it began to ache, and continued so till excision. This was advised on account of commencing irritability of *R.*

At excision the T was increased (T 1). There were some small posterior synechiæ at the lower pupillary border. The Anterior Chamber was of normal depth.

Microscopical Examination shows the measurements of the Upper Ciliary Region to be, muscle, $\cdot46$; Circulus Major, diam., $\cdot038$; walls, $\cdot012$ mm.; and the Lower, muscle, $\cdot70$; Circulus, diam., $\cdot017$; walls, $\cdot008$ mm. The muscle below is well developed throughout, whereas above it has its antero-internal part especially atrophied. There is scarcely any increase of nuclei whatever in the muscle at either region, Pars Ciliaris Retinæ or Iris, which last is free both above and below. The Canal of Schlemm is normal. On the internal scleral surface at the seat of the wound there is a prominent white cicatricial mass of tissue resembling the Sclerotic in structure, though its fibres are more irregularly disposed. Near it there are remains of a little Choroïdo-Retinitis.

The Long Ciliary Arteries are a little enlarged as they perforate the Sclerotic. Some specimens show a narrow empty space surrounding the artery and nerve. There are no local staphylomata anywhere. The Vitreous is fluid towards its posterior part. The Optic Disc presents a central pit, of the kind usually known as physiological, with very slight curving back of the Lamina Cribrosa.

I add accounts of two very interesting cases allied to these.

No. 777. Amelia D., æt. 50. Her *R.* eye, blind for at least 10 years with a cataract of unknown origin, is afflicted with a Glaucoma, probably of six weeks' duration. She noticed nothing wrong with it till she accidentally found 10 years ago that she could only just see light. Since then it never troubled her till she received a blow with a stick 6 weeks before excision. Then it inflamed, and for the last 6 weeks has been extremely painful.

At excision the pupil was widely dilated and eccentric, the

Lens cataractous, and the Tension increased (T 3). Microscopical sections show the Ciliary Muscle *above* to be extremely thin in texture, and to measure only $\cdot 33$ mm. in thickness, while *below* its texture is good, and its measurement $\cdot 7$ mm. The Arterial morbid changes exactly correspond with the muscular, for the Circulus of the *Upper* Ciliary region measures $\cdot 06$ mm., with wall thickness $\cdot 001$ mm., while *below* the corresponding Artery measures $\cdot 033$ mm., with walls $\cdot 005$ mm. thick. The Canal of Schlemm is only moderate sized *above*, though large *below*. The Iris is slightly inflamed both above and below, but while its periphery is firmly adherent above, it is unadherent though apparently applied to the Cornea below. The Optic Disc presents a moderately deep, though asymmetrical cup. There are no inflammatory changes other than those already mentioned. The Long Ciliaries were not examined.

Her other eye was presbyopic, but in other respects normal.

This case was figured in the author's previous paper (R. L. O. H. Reports, vol. ix, part 2). Then the Arterial changes were overlooked. The large blood spaces were generally incorrectly mentioned as veins.

No. 771. William F., æt. 67. 11 years before its excision a cataractous lens was extracted through the pupil of his *L.* eye by the old flap method. The case did well notwithstanding that the upper limb of the Iris remained adherent to the scar. After 9 years the sight began to fail, and pain came on in the eye, continuing till excision. Then the pupil was widely dilated, the upper limb of Iris very short and adherent to cornea. T was increased (T 1).

Examination after excision. Vitreous rather fluid; Ret. detached above between O. D. and equator; *Ciliary Region above*: muscle measures $\cdot 44$; texture thin; Circulus Major, $\cdot 043$; walls, $\cdot 002$ mm.; Iris adherent at base and at scar, intermediate part applied; Canal of Schlemm barely visible.

Below. Muscle, $\cdot 5$; texture good; Circulus, $\cdot 013$; walls, $\cdot 006$ mm.; Canal of Schlemm as above. Iris periphery is free from the Cornea; it contains a slight excess of nuclei.

The *Optic Disc* presents a shallow cup, which is not well seen in the sections. The Long Ciliary Arteries were not examined. No other important changes are visible anywhere.

Group II shows much the same alterations as in pure Glaucoma in the Vitreous, Pars Ciliaris Retinæ, Retina, &c. In other respects also the resemblance is close; the Iris is free in 7 specimens as compared with 19 in which its periphery is adherent to the Cornea. Schlemm's Canal, however, is only absent in one specimen, while it is small in 18 and of large size in 7. In 3 of the cases it exists in conjunction with a perfectly free Iris, both above and below.

Scleral Staphylomata are found along the course of a dilated Internal Long Ciliary Artery in 5 cases. One case has also a dilated Long External Ciliary, though without accompanying Staphyloma.

GROUP III.

This is a very interesting and important series of cases. In it are comprised those in which Intraocular Tumours are accompanied by increased Tension. It includes 5 cases, 3 of Sarcoma of Choroid and 2 of Glioma of the Retina.

The pathological changes accompanying the tumours are precisely those of pure glaucoma; and the average arterial enlargement is even greater, corresponding to the usually greater Tension. The muscle is also somewhat less atrophied, probably also in relation to the less average duration of the glaucoma; for the pain accompanying the glaucoma brings the patient under care early, and when the diagnosis of tumour is established, excision of the eye rapidly follows: thus, the Ciliary Muscle averages $\cdot393$, the Circulus, $\cdot054$, and its walls, $\cdot0028$ mm. The Iris is adherent in 4 cases, applied in 4, and free in 2. A little Iritis exists in all, caused apparently as in Group I. But there is one case in which the Iris has some adhesion to the Anterior Lens Capsule, and therefore, here at least, it is probable that its inflammation has preceded its application to the corneal margin. Schlemm's Canal is closed in 3 cases, of moderate size in 4, and large in 3. There is no specimen showing Schlemm's Canal open, and the adjacent Iris periphery free.

It is to be remarked that the muscular atrophy, as well as the dilatation and thinning of the Circulus Major, are as pronounced on the side furthest away from the attachment of the tumour to the Retina or Choroid as anywhere else. In fact, the changes are sometimes even greater on the distant side than close to the tumour.

Included in Group VII (— T) are also 3 eyes containing Sarcomata. In 2 the Tension has never been in excess, but the 3rd eye may not unlikely have been hard formerly. The Ciliary Muscle is bulky and tolerably well-developed in the first 2 cases, but in the 3rd, though it occupies considerable space, its structure is moderately atrophied. All these present a small Circulus Major, both near to and on the side away from the tumour. Its average diameter is $\cdot 0194$, and its average wall thickness $\cdot 00716$ mm.

One of these cases is that referred to in Group I in the observations on the conditions of Schlemm's Canal, as having slightly diminished Tension, with the Anterior Chamber of the Aqueous much narrowed or even blocked below.

The tumour mass implicates the Optic Nerve entrance in 2 cases of + T, and in one of the cases with — T.

A characteristic example of Group III is No. 367.

Clara W., æt. 23. Eight months ago she had double vision for a time. After this the *Left* eye gradually faded till perception of light was lost. Six weeks ago severe pain came in the *Left* side of the head and in the eye, which lasted till excision. The *Right* remains normal.

At Excision. *Left*, pupil dilated and fixed; no Iritis visible. Enlarged Anterior Ciliary Arteries visible in front. Greyish reflex from fundus. T 1.

Equatorial section. Ret. detached in loose folds, except at O.D. and Ora Serrata. It is also adherent at the apex of a dark-coloured smooth sarcoma, the size of a small bean, occupying the lower and inner quadrant of the globe, from close behind the equator up to the O.D., which is just involved in it.

Sections of the Upper Ciliary region show, Cil. Muscle, $\cdot 44$,

moderately developed; Circulus Major large, $\cdot 055$; walls thinnish, $\cdot 003$ mm. Iris base applied to Corneal Margin, some large blood-vessels in it, and possibly a very slight excess of nuclei. Canal of Schlemm of moderate size.

In the Lower Ciliary region, the Iris, Muscle, and Circulus are the same, but the Canal of Schlemm is large. Vertical sections of the inner periphery show the Long Internal Ciliary Artery much enlarged, diameter probably $\cdot 15$ mm., but its walls are thin, $\cdot 005$ mm., and collapsed. The Choroid here is absorbed in the tumour mass. There are no tumour cells in the Sclerotic.

Vertical sections of outer side show the Long Ciliary Artery slightly enlarged; the Choroid rather thicker than normal, apparently on account of enlarged blood-vessels contained in it. There may possibly also be a slight multiplication of nuclei in its Stroma.

The tumour has invaded all parts of the Optic Nerve entrance internal to the Lamina Cribrosa.

GROUP IV.

This comprises 19 cases, in which inflammation of some part of the Irido-ciliary-choroidal tract accompanies + T, and may be its immediate cause.

The inflammatory changes here are different from those very slight ones described as occurring sometimes in the Iris in Groups I, II, and III, and they differ in their course and appearances from the Iritis and its frequently-accompanying Cyclitis, met with in Group V. The forms of inflammation are various, it being due in most to some constitutional cause, such as Rheumatism, as in one case, or Syphilis, as in 2 cases. In 3 cases an injury has been followed by Plastic Inflammation, and in 3 more Suppurative Panophthalmitis has set in after accidental or operation wounds.

In this Group the changes in the Ciliary Artery and Muscle are much less conspicuous than in any of the preceding. For example, the total average muscular thickness is $\cdot 5038$ mm., the diam. of the Circulus Major $\cdot 0345$ mm., and its wall thickness $\cdot 0078$ mm. In fact, more than half

the Group (10 cases) present no special changes either in Muscle or in Artery. But the remainder (9 cases) closely resemble those previously described under Groups I, II, and III, in the condition of the Artery, though the walls are thin in 4 cases only. The Ciliary Muscle is tolerably well developed in all but about 5 cases.

In 9 cases, then, the inflammatory condition and the dilated arteries are found in company, and we may look to one or the other, or indeed to both combined, for the cause of the Tension.

In certain of them, however, there are strong reasons for thinking that the + T is not due to the inflammation. This is the case in the 3 eyes with suppurative Panophthalmitis; for in Group VII (with - T) we find 3 similar cases. And though these two sets of cases differ in their duration, and to some extent also in the parts more especially involved, yet the most striking difference between them is in the arterial diameter: for example, in the 3 cases with + T, the average diameter of the Circulus Major is .0468, while in the 3 with - T it is .0195 mm. The wall thickness is much alike in both sets, being greater than even in healthy eyes. The Choroid, however, is only implicated in one of the cases with - T to the same extent as in the others, though even this does not extend in any beyond some multiplication of scattered nuclei and oedema. In fact, there is no evidence in its condition at excision that the Choroid has been the starting point of the inflammation, or that by a Choroiditis Serosa it has produced the + T, which is not due to a purulent infiltration of the Vitreous either, causing an increase in its bulk; for in one of the cases + T goes with an actual diminution in its size and detached Retina.

The average duration of the 3 cases with + T is 10 days, and of those with - T one month.

As far as the arteries are concerned, the same observations apply generally to the cases with plastic inflammation of the Irido-Ciliary-Choroidal tract.

Thus the average arterial diameter of the 3 cases found in this Group is $\cdot 042$ mm., while that of the 6 similar cases in Group VII (with $-T$) and the one in Group VI (with T normal) together is $\cdot 014$ mm. The general microscopical changes are the same irrespective of the Tension. But the duration of the disease differs somewhat, the average of the first being 7 weeks, while in the cases with normal or $-T$, it is 11 weeks.

No enlarged artery can be recognized, however, in one of the 3 cases with $+T$, and the only condition that could possibly resemble it in its effects is the presence of large thin-walled blood spaces close to the internal choroidal surface, in the neighbourhood of the Ora Serrata.

To this explanation, however, I do not think we are justified in attaching much importance, and the case remains as an important exception. I regret very much that its Long Ciliary Arteries were unexamined. Clinically, this form of inflammation is frequently observed to be accompanied with varying Tension, an increase being usually found in its earlier stages; while later on $-T$, with a shallow aqueous chamber, is more frequent.

The Ciliary Muscle is well developed in these as in Suppurative Panophthalmitis, and this is probably due to the fact that excision in these cases followed comparatively rapidly on the establishment of the disease. The same remark applies generally to the walls of the artery.

One of the cases of Plastic Choroiditis is so interesting that I give it briefly here. It will be seen to be probable that the enlarged arteries and the inflammation are both directly caused by the accident, and that therefore the case would have been more properly included under Group II.

No. 371. Thomas M., *æt.* 40. A blow, 3 weeks before excision, ruptured his *Left* globe along the upper Sclero-corneal margin. Pain began 2 days later and continued till its removal; then there was a dull reddish reflex from the fundus, with the barest perception of light and $T2$.

Equatorial section of the globe shows the whole Iris and Lens to be absent; they have probably escaped through the rupture. The Vitreous is partly opaque; it contains blood; its central part is thin and syrupy. There are extensive patches of Plastic Choroiditis.

In the *upper Ciliary Region* the muscle measures $\cdot 28$; its structure is fair. The diameter of the Circulus is $\cdot 043$; its walls, $\cdot 008$ mm. The Canal of Schlemm is closed.

In the *lower* the muscle measures $\cdot 38$, structure fair. Circulus, $\cdot 040$; walls, $\cdot 008$ mm. Canal of Schlemm open.

The *Long Internal Ciliary* is much enlarged, and its walls are thinned. Diam. = $\cdot 086$ mm; walls, $\cdot 005$. There was no Staphyloma corresponding to it.

The Optic Disc is not cupped, but there is more curving back of the Lamina Cribrosa than is normal.

The other eye is a little irritable, but its vision and accommodation are perfect.

Therefore in the 3 cases of Suppurative Panophthalmitis and the 2 of Plastic Inflammation of the Choroidal tract, I connect the increased Tension with the enlarged blood-vessels. I can speak less decidedly as to the influence of this condition on the 4 remaining cases in which it occurs.

For in Case No. 229, a man, æt. 46, though the choroidal inflammation is of long standing, and not now acute, yet there accompanied it at the time of excision Iritis and Hypopyon, together with a recent Corneal ulcer. The Circulus is extremely large, and its walls very thin.

And in Case No. 226, a woman, æt. 28, there is great Iritis, with excluded pupil and adherent base of Iris, together with a little Cyclitis, and slight multiplication of nuclei in the Choroid generally. There have been corneal nebulae, and also some changes in the Iris since childhood. The Circulus Major is moderately enlarged with thin walls.

No. 342 is a girl, æt. 8, with congenital syphilitic disease. The Iris is inflamed and adherent to the Cornea. There is inflammation of the Ciliary body of long standing, with great atrophy of the Ciliary muscle. The Choroid and Retina, adjacent to the

Ora Serrata, are inflamed, with considerable multiplication of the Retinal pigment epithelium. And in addition to a general bulging of the thinned Cornea and adjacent Sclerotic with its atrophied Ciliary body, there are indications of an accumulation of fluid between the Sclerotic and Ciliary body itself. The Circulus in the atrophied Muscle is moderately enlarged, with extremely thin walls. There is also considerable enlargement of the Long Internal Ciliary Artery, and of the space surrounding it and the nerve in their Scleral tunnel. The Optic Disc is cupped.

In the last Case, No. 147, there is, together with Iritis of 20 years' standing (possibly specific), more recent Choroiditis near the Ora Serrata, corresponding to which there is a local Scleral Staphyloma of the Upper Ciliary region. There is moderate multiplication of nuclei in the Iris, and the Pupil is excluded. The Ciliary Muscle is atrophied, and the Circulus much enlarged and thinned, especially above, near the Staphyloma. There is a large deep cup, indicative of long standing + T.

Judging from the history and appearances, I conclude that in the first 3 of these cases, and probably also in the 4th, the Tension is due, principally at all events, to the same causes as in the three groups previously treated of.

One of the remaining 10 cases (those without enlarged blood spaces) has already been discussed as a case of Plastic Choroiditis. In another Iritis Serosa was diagnosed during life, and appeared from the increased depth of the Aqueous Chamber to be the cause of the + T. And as a similar microscopical condition was found affecting the Ciliary tract and Choroid, it is probable that a Serous Cyclitis and Choroiditis participated in causing + T. In this eye the Ciliary Muscle was well developed, the Iris periphery free, and the Canal of Schlemm open, though surrounded by an excess of nuclei. The Circulus was of normal size, diam. = .022 mm., and its walls of average thickness, .004 mm. The Long Ciliary Arteries were not examined. There were no staphylomata visible anywhere. The condition of the supra-choroidal space, and of that surrounding the Long Ciliary Artery and nerve while perforating were not determined.

Of the 8 cases left, three have great Irido-Cyclitis. This is attributed in one case to Rheumatism, and in another to Syphilis. Both have excluded pupil. In the Rheumatic case and in the 3rd one, the inflammation may have been aggravated by a recent attempted Iridectomy, though the T, as evidenced by the history and the appearances of the Optic Disc, is of much longer standing than this.

Microscopically, I see nothing to distinguish the Cyclitis occurring in 2 out of these 3 cases at least, from what will be described as sometimes met with in, and even typical of, the next group.

Only 5 cases remain, and these are interesting as presenting some points of mutual affinity, though the proper position of one of them (No. 185) is somewhat doubtful. In these Choroiditis appears to have been the primary, and still remains the principal affection, for though some little Iritis is found, it is scarcely more conspicuous or important than in the cases of Group I. The Choroiditis differs from any previously referred to as occurring in this Group. Though I see nothing else to account for the + T, yet I am unable to say that this inflammation differs microscopically to any great extent from that which is rarely or ever accompanied by + T, as for example, Choroiditis disseminata.

The first 2 of these cases seem the most striking, as having been examined more recently, and therefore more fully than the others.

No. 214. Joseph K., æt. 56. Fourteen weeks before excision a blow dislocated the Lens of his Right eye. Its Vision was afterwards dim and confused, but there was no pain. Tension was normal. Three weeks later the Lens was removed, and during the operation Vitreous was lost. Iridectomy was attempted at the same time, but the unremoved base of the Iris remained entangled at its free end in the operation wound. Constant pain in the eye then came on till excision was performed, on account of the irritable condition of the other. Then T 2.

In the Upper Ciliary region the Iris was entangled in the

slightly bulging scar, its base adherent, and its intervening portion loosely applied to the Cornea; there was trifling Iritis and Cyclitis. The muscle was well developed. The Circulus was normal, and the Canal of Schlemm open.

Below: the Ciliary region and Iris were normal, with the exception of slight Iritis and Cyclitis, as above.

The Vitreous was fluid and clear, except a small hazy, opaque, white spot at its lower part.

The Optic Disc presents a small shallow cup, not reaching to the margin. The Lamina Cribrosa is slightly curved back.

The Choroid and Retina are *in situ*. Near the inner equator is a small coal-black area, with a lighter centre. A microscopical examination of this shows that the retinal pigment epithelium is densely black and increased in thickness; root-like processes extend inwards from it into the Retina. The granule layers thus penetrated have lost their precise boundaries, and nothing can be made out but nuclei, resembling the granules in shape, loosely scattered as far internally as the nerve cell layer. The rods and cones have entirely gone. In the Choroid, just external to the pigment, there is a greyish rounded exudation mass, whose structure is irregularly and indistinctly fibrillated, and which contains a few rounded nuclei scattered through it, and more surrounding it.

The Internal Long Ciliary Artery and its accompanying nerve, in which are excess of nuclei, are surrounded in their scleral tunnel by a clear space of considerable size. The Choroid has separated from the Sclerotic in every specimen, so that it is uncertain whether the supra-choroidal lymph space was enlarged or not. There were no scleral staphylomata. No sections were obtained, showing the External Long Ciliary Artery and Nerve in their passage through the Sclera.

Case No. 231. Dinah H., æt. 36. She had a blow upon her *Right* eye with a piece of wood, 19 years ago. When discharged after a stay of six weeks in hospital, some opacity of the Lens near its posterior surface remained, but otherwise the eye seemed well. She could see her way about with the *Right* alone. The *Left* had good vision, which it still retains.

Six months ago the *Right* came dim, and lately it has been more so. Pain came in it 4 days before its removal, which was performed on account of irritation of the other.

At excision, there are some small posterior synechiæ. There is

a bluish-black, patchy, atrophic appearance of the ciliary region all round, just behind the Sclero-Corneal junction. On the globe being opened, the Iris periphery is seen applied above and below; there appears to be no Iritis, the Canal of Schlemm is visible below, but not above. The muscle is good on both sides. The Circulus Major is normal. There is a well-marked staphyloma of the Sclerotic, just behind the sclero-corneal junction; the bulging appears to be due to an accumulation of fluid between the Ciliary Muscle and Sclerotic, separating the two, and penetrating among and opening out the most external fibres of the Ciliary muscle.

The Retina is detached in loose folds, except at the O.D. and at its ciliary attachments. The Vitreous is thin and yellowish. The O.D. presents a shallow cup over its whole surface. On either side of it are two irregular black circles, each enclosing a greyish-pink area; a larger white atrophic choroidal patch is also near.

Microscopical sections through the patches of diseased Choroid show the black and thickened Retinal pigment layer adherent to it, except at the centre of the patch, where it is deficient. Lying internal to this is a layer thickest at the centre of the patch, and tapering off to its sides, which appears to be very indistinctly fibrillated, and has scattered through it a few round nuclei. The Choroid corresponding to this contains a slight excess of nuclei in places, but is generally thinner than normal. In the specimens the Choroid is always detached from the Sclerotic, but there are indications of an enlarged Supra-Choroidal space. The Long Internal and External Ciliary Arteries are normal, but they and their accompanying nerves are surrounded by an enlarged scleral tunnel.

Besides their somewhat similar microscopic appearances, there is evidence in the clear space surrounding the Long Ciliary Nerves and Arteries, that the 2 cases above described are of the same nature. It is likely that more exact examinations of Choroiditis or Choroido-Retinitis accompanied by + T, will reveal points distinguishing them microscopically from inflammations of the same structure, which are rarely accompanied by Tension.

The next two cases were examined in 1876-77, and, consequently, their record is not complete. In them the existence of Choroiditis is indicated by a staphylomatous

bulging of the Sclerotic of the upper and outer side of the eye in front of the equator. The Choroid corresponding to the centre of the staphyloma is in each case very thin and atrophic. It is very closely applied to the Sclerotic. The pigment epithelium layer over it is thickened, and is constituted of small irregular brown cells.

In Case No. 61, the margin of the Staphyloma borders on the upper ciliary region. The sections of this show the affected choroid to have the epithelium lying on it thickened and irregular. Its stroma is moderately infiltrated with round or elongated deep-staining nuclei.

In the second Case, No. 160, the margin of the staphyloma is not well seen in any sections, but the ciliary region in front of it has an irregular multiplication of the pigment of its anterior part somewhat like, though less pronounced and abundant than, what is seen in some cases of the next group.

I class these 2 cases with the preceding 2, for though in them the Choroid has arrived over a considerable area at an atrophic condition, there is in one of them, at least at the edge of the diseased patch, an increase of nuclei in its structure, and a similar alteration in its pigment epithelium. In the other the direct evidence of affinity with the first two is less clear, but the microscopical appearances of the Choroid in the centre of the staphyloma link it to the 3rd case. Unfortunately the Long Ciliary Arteries were not examined in their course through the Sclerotic in either case.

However, all four are further associated, in that there is present in all but the iridectomized case (No. 214) a true Scleral Ciliary Staphyloma above. The accumulation of fluid between the Ciliary muscle and Sclerotic causing this is interesting, taken in association with the enlarged space round the Long Ciliary vessels and nerves.

Neither enlarged spaces round the Long Ciliaries, nor any forms of Scleral Staphyloma have been met with in any of the cases of Groups I, II, III, and the general Corneal and Scleral yielding sometimes caused in the next Group

by pressure from within, acting on a thinned Ciliary muscle and Sclero-Corneal region, differs altogether from the Ciliary staphylomata found here. Of course local staphylomata also may occur in tumour cases by the yielding of a Sclerotic weakened by an extension of the tumour cells into it.

The true Scleral Ciliary Staphyloma is met with in two more cases of Group IV, one (No. 185) of which a short account will be given below, and another (No. 147) briefly described above, as possessing marked glaucomatous arterial changes. This globe has also a marked Scleral Staphyloma between its Superior and External Recti muscles. Some Choroiditis is visible near the anterior margin of this.

The other remaining case of this Group (No. 185) is a peculiar one. It has a Scleral Ciliary Staphyloma and also a little Choroiditis. But besides this, the Iris is inflamed and adherent to the Cornea throughout, consequent on its prolapse into an old rupture. In this respect it closely resembles the next Group with which perhaps its affinities are stronger. I briefly quote it.

No. 185. Sarah M., æt. 19. Eleven years ago she pricked her *Right* eye near its outer corneal edge with a fork. No notice was taken of the accident, but 12 months later its sight was found to be much deteriorated. She has had slight pain in it for some years, but more within the last 12 months. The *Left* eye is normal.

At excision, *Right* has +T; no perception of light remains. A swelling is seen to the outer side of the Cornea containing the remains of the Lens which had escaped under the Conjunctiva, through the ruptured Sclero-Corneal junction. There is a line of pigment in the scar representing the remains of the Iris. The Globe is enlarged. The Vitreous is fluid. The Ciliary muscle is generally well developed. The Circulus Major is a trifle large; its walls are fairly thick. The Iris is represented by a line of pigment in the scar of the rupture. Elsewhere it is closely adherent to the Cornea, and its nuclei and uveal pigment cells are increased in number.

Near the scar the Ciliary body has its pigment epithelium

thin and a little irregular, as if from old Cyclitis. Here the muscle also is rather thinner, and just behind the Ora Serrata is a small greyish patch of Choroiditis, which was not examined microscopically.

There is a large staphyloma of the Sclerotic of the upper Ciliary region, corresponding to which the outer fibres of the ciliary muscle are separated. The Optic Disc presents a moderately deep universal cup. The Long Ciliary Arteries were not examined.

The microscopical appearances of the Iritic and Ciliary affection resemble those found in the next group.

Among the 19 cases forming this Group, there are several in which the pupil is excluded. In two of those briefly quoted, an Iridectomy which has removed this condition has produced no effect on the Tension. But in both there was at excision an acute inflammation of the Irido-Ciliary tract.

Many cases with excluded pupil are found in Group VII (—T). To this, however, much importance need not be attached, as clearly no such exclusion would have the effect of raising the tension of a shrinking eye.

More interesting is a case of Buphthalmos (No. 773) belonging to Group VI. Here the Tension is noted normal at excision, though the Optic Disc shows that it was for a long time increased. The patient is a boy 5 years old. His parents say that the eye (the left) was large at birth. The measurements of the whole globe are increased, but the anterior chamber of the Aqueous is especially deep. The Iris is adherent to the Lens Capsule throughout, so as to thoroughly cut off communication between the Aqueous and Vitreous Chambers. Notwithstanding this, Schlemm's Canal is extremely large, and its communications with the anterior chamber are very patent, owing to the wide angle between the base of the Iris and the Cornea.

There is scarcely any evidence of present Iritis or of inflammation of any other part of the eye. The Circulus Major is rather large, but its walls are of normal thickness.

The Ciliary Muscle is well developed. The Retina and Choroid are *in situ*. The Optic Disc is cupped. The Long Ciliary Arteries were not examined.

Doubtless the very fact of the pupil being excluded is an indication that Iritis has preceded the Tension. For had there been none, the Iris instead of being in contact with the lens at its pupillary margin would have been pushed forwards, so that no adhesions could be subsequently formed, except to the Cornea.

The Anatomy of Cysts of the Iris shows that secretion of fluid from its posterior surface takes place, sometimes at all events. And the bulging of it forwards, frequently seen in excluded pupil, is evidence in the same direction. Some facts will be put forward while discussing the next Group, as to the connection of the pigment epithelium of the Iris and Ciliary body with the secretion of fluid. The Tension in two cases of Choroiditis previously recited (Nos. 214 and 231) might be explained by supposing that the Retinal pigment epithelium may have or take on a similar function.

I will, however, readily admit that Exclusion of the Pupil may have an effect in keeping up the Tension, possibly by cutting off access to Schlemm's Canal, or by preventing transudation into or through the Cornea.

Either explanation would help us much in certain cases of the next group, where an atrophic pigmented layer, representing the remains of the adherent Iris, is applied to the posterior corneal surface throughout.

GROUP V.

This series of cases is one well marked clinically. It consists of 22 cases in which the Tension has followed a Corneal Staphyloma in which the Iris is also involved. This condition is, in nearly all the cases, the result of the prolapsing of the Iris into a perforating Corneal ulcer. There are peculiar inflammatory changes in the Iris, and

usually also in the adjacent Ciliary region. But the vascular changes characteristic of pure Glaucoma are missing in 16, and are only superadded to the other conditions in 6 cases, in most of these even at a much later period and to a much less extent than in Groups I, II, and III.

Thus, in the whole of Group V, the average diameter of the Circulus Major is $\cdot 0273$ mm., and its average wall thickness $\cdot 0058$ mm. And if the 6 cases be excluded, in which the artery is dilated, the average of the remaining 16 is, muscle, $\cdot 441$ mm.; artery, $\cdot 02186$ mm.; walls, $\cdot 0067$ mm. These figures differ very little from the averages of diseased eyes with normal Tension (see page 380).

In all of the cases the Iris is stretched forwards, and is adherent to the Cornea at the Staphyloma, usually throughout its whole extent. But in three cases of this Group one limb only is thus involved, though even in these the Iris periphery is adherent all round. Thus access from within the globe to Schlemm's Canal is prevented in every case. The prolapsed Iris is soon covered with lymph which organizes and forms ultimately a leucoma. The Iris in the neighbourhood of this becomes much inflamed and irregularly thickened, its nuclei are multiplied, its Uveal pigment increased and irregularly disposed. The rest of the Iris is stretched, thinned, and applied to the Cornea, to which its base becomes adherent. Though at first inflamed, it rapidly becomes atrophied, till, in many cases, but little is left except a web of pigment clinging to the posterior corneal surface.

The Aqueous Chamber posterior to the Iris gradually increases in size as the cicatrix and whole Cornea also gradually yield. This general yielding is partly due to the increased pressure, but partly also, perhaps, to some change in the Corneal tissue coincident with the affection of the Iris adhering to it, which renders it more yielding. For this staphylomatous bulging occurs where the Cornea is actually thickened and vascular.

But, should the Lens have also become adherent, the

Corneal cicatrix sometimes ceases to yield and becomes very thick and opaque. The Aqueous Chamber is not enlarged, and the increased pressure is transmitted to the Vitreous Chamber.

But so long as the Aqueous Chamber enlarges, there is very little increase of pressure in the eye as evidenced by palpation, and by the state of the Optic Disc. The pressure is also kept somewhat down by a very gradual increase of all the measurements of the eyeball, if the patient be young.

The process may cease here, but in nearly all cases the multiplication of pigment very gradually extends to that covering the Ciliary body. Hitherto the Ciliary muscle has remained quite unaffected, but now its nuclei increase at the same time as the pigment cells and other elements covering it internally. Finally, though gradually, this excess disappears, leaving the muscle either moderately developed, as in the milder cases, or extremely thin. With its atrophy a general Scleral and Corneal thinning takes place, which may yield to the pressure within the globe, thus forming sometimes a general staphylomatous bulging of this region. The pressure causing this condition comes from within the Vitreous and Aqueous Chambers, and is not due to an accumulation of fluid, as in the last Group, between the Ciliary muscle and Sclerotic. But there are two cases here in which true *Scleral* Ciliary Staphylomata are met with.

Sometimes the pigment increase is chiefly confined to the apices of the Ciliary folds, which are thus darker in colour than normal. They are also sometimes stretched forwards towards the apex of the Staphyloma by the advance in the position of the Lens, which is sometimes met with in these cases, by reason of its adhesion to the Cornea.

But sometimes the pigment covering the Ciliary body internally is also multiplied, and a very characteristic appearance may be presented. In the most typical cases

the pigment layer is of many times its usual thickness. The outermost cells are perhaps somewhat lighter in colour than normal, but internally they gradually shade off into a loose irregular stratum of still less pigmented cells, intermixed irregularly with the most internal of which is a loose mass of unpigmented cells. These are sometimes seen to be bounded internally by a distinct layer of nucleated cells.

I think, from one of the cases quoted below (No. 364), that the Ciliary body when first affected presents simply a multiplication of the pigment cells contained in the loculi internal to and formed by extensions from the Vitreous Lamina covering it. Further observations are, however, required on this subject.

Of the 22 cases comprising this group, 18 present Iritis in an active condition. In 4 of these the Iritis is combined with the changes in the Ciliary body, which I have described as typical, and of these 2 present, in addition to the Iritis and Cyclitis, the typical Glaucoma dilatation of the arteries.

In the 4 remaining cases Iritis is not a prominent condition in any of my specimens, indeed atrophic changes are far more conspicuous in the Iris. The Tension might perhaps be accounted for in two of them by the dilated arterial condition which occurs in both to a moderate extent. The other two seem neither to have a dilated Circulus Major nor Iritis, nor any acute Cyclitis. But one of them (No. 224) has, however, its Long External and Internal Ciliary Arteries enlarged. It has also a Ciliary Scleral Staphyloma, but the Circulus Major was scarcely recognisable in the atrophied layer representing the muscle. The eye was lost, and apparently also hard since infancy (19 years).

The other case (No. 109) has also been blind since infancy (12 years). The Cornea and adjacent Sclerotic were thin. The Ciliary muscle was vastly atrophied, and in it the small Circulus could scarcely be recognised.

There was great multiplication of the pigment of the posterior part of the Ciliary Circle, but it seemed rather like the remains of former inflammatory changes, as there were no unpigmented cells mixed with or superficial to the loose pigmented layers. The Long Ciliaries were unfortunately not examined, though thinning is noted both on the inner and outer side of the Optic nerve entrance. The examination of this case was made in 1876.

Such cases are difficult to explain. It is, however, not unlikely that a more minute or extended examination would have shown parts of the Iris or Ciliary body in a state of active inflammation. But apart from this there is little to fall back on besides the adhesion of the Iris to the Cornea. This would have the same effect as an excluded Pupil, about which something has been already said in treating of Group IV.

The above-described condition of the Ciliary body and Iris inclines me to the belief that an increase of the pigment epithelium of either or both may cause plus Tension. But evidence from other sources confirms this but partially. For example, there are certain cases in which, if this pigment layer has normally for its function the secretion of fluid within the eye, the Tension should be minus, for in them the pigment epithelium cells are disintegrated, and fine black granules are loosely scattered over an extended area evidently corresponding to that occupied by the formerly multiplied cells.

This condition is characteristically seen in 4 cases. Three of them have -T, the 4th one, not quite, however, so typical a case, has +T. In this exceptional case (No. 83) the Iris is still inflamed. The Circulus Major, though rather large, yet seems not sufficiently so, judging from the cases of the other groups, to account for the Tension. The Long Ciliaries were not examined.

But it is in examining Groups VI and VII that we find the greatest difficulty in determining the relation of the changes in the pigment to the Tension. In these

there are 5 cases in which normal or $-T$ has followed $+T$ due to Corneal Ulcer with entanglement of Iris. The Iris is distinctly inflamed in 2 of these cases, nor can I detect any difference between its inflammation and that of cases of Group V, except that it is less acute than in most of these. In the other 3 there is certainly no marked atrophy of the pigment of the Ciliary region, though there has formerly been inflammation, and though the Iris is atrophied, yet this is a condition which has been described as being found, together with $+T$, in several of the cases of Group V.

And though the Iritis in this Group is peculiar, inso-much as it has taken its origin in a special manner by means of the Corneal Ulcer, and though it is not attended with secretion of pus but with pigment multiplication, yet I am unable to say from microscopical examination that there is anything in the Iritis so excited that distinguishes it from any other form. But on the other hand I have seen a slight apparent increase of pigment in Suppurative Iritis and Cyclitis without $+T$, though in these cases the pigment was intensely black and more irregular than even in Group V.

This being so, one turns to the other conditions found in this Group, to see if they offer any explanation of the Tension.

Corneitis always precedes the Iritis, and in one case this was attended with inflammation, adhesion, and atrophy of the Iris limb corresponding to it, though there was no perforation. But as the Iris is closely adherent to the Cornea, the increase of fluid may have come either from the posterior Iris surface or from the Vitreous Chamber, and cannot possibly be derived from the posterior Corneal surface.

In every one of these 22 cases the Iris is adherent at its base to the Cornea, indeed there are only 3 cases in which the entire Iris is not applied. In them one limb is free except at its base.

Thus the Canal of Schlemm, though it is open more or less in 12 cases, yet has no apparent function in any. But I am unable to say whether its condition has had any part in causing + T. I have come to the conclusion that it has exerted little or no influence in the preceding Groups. Certainly the 3 cases of Group V, in which one limb is free except at the base, seem to show that the pushing forwards of the Iris, and consequent closure of the Canal, occurs second to the increased Tension.

I have referred to the fact that the Canal of Schlemm may be blocked in part of its circuit, and the Tension remain normal or even be slightly diminished.

A case, previously referred to as having the Anterior Chamber and Schlemm's Canal below nearly or quite blocked by a Sarcoma of the Iris, has a slight diminution of T, together with nearly perfect vision.

In this Group the Iris lining the Cornea would check any transudation of fluid through it, except partially in the 3 cases in which one limb is partly free, supposing that any such transudation normally takes place, and that, as seems likely, the Iris is impermeable to fluids.

It is possible that the stretching forwards either of the Iris or apices of the Ciliary processes, may set up some nerve irritation which may cause hypersecretion or increased transudation; but this is of course purely speculative.

In connection with Group V, the following cases deserve recital.

No. 364. Joseph R., æt. 40. Eyes quite well till 9 weeks ago; then he had pricking pain and watering of the *Left*. He had no treatment till he came here 6 weeks later. Then there was a large bulging Staphyloma of the lower $\frac{1}{5}$ th of the Cornea. The unaffected part of the Cornea was tilted upwards and forwards. The Pupil was much dilated, its lower part involved in the Staphyloma, the Lens hazy, and Vitreous clear. The Optic Disc looked hazy. T 2. The *Right* was normal.

Things remained the same till excision. Then the globe was

found to be 30 mm. long to the apex of the Staphyloma, which measured about 7 mm. from above to below, and 14 mm. from side to side. The Cornea is thin near the apex of the Staphyloma, but thick and irregular at its margin, beyond which the Sclerotic looks normal. The Aqueous Chamber is very deep. The entire Iris limb is adherent to the Cornea below; for the most part it is represented only by a thin pigmented layer, but near its apex it is inflamed and thickened. The Muscle of the lower Ciliary region is somewhat thinner than above, where it is about normal. There is apparently some slight multiplication of the pigment cells below, but still they are quite regularly disposed as pigmented processes extending outwards towards the muscle from the general level. Their colour is perhaps somewhat diminished in intensity. The Circulus Major as seen both above and below is rather small. The Iris base is adherent above. The Long Ciliary Arteries are rather large, but there is no special wall thinning; there are no Staphylomata in their course. The Vitreous is more fluid than usual. The Optic Disc presents over $\frac{3}{4}$ ths of its extent a shallow depression. In other respects the eye appears normal.

No. 248. Sarah H., æt. 17. Her *Right* was lost in infancy with perforating ulcer from Ophthalmia Neonatorum. Judging from the usual course of such cases in this Group, increased Tension probably followed, though the Tension afterwards became less than normal, as evidenced by the size of the eye, its diameter being about 19 mm., and by a groove extending from the Inferior Rectus insertion to the adjacent corneal edge. The Cornea is small and opaque, it has indications of marginal thinning above. T 2.

Microscopic examination: The Ciliary muscle has generally good structure, it measures .38 mm. There is some enlargement of the Circulus Major at the lower part of its course, its walls are however fairly thick. There is vast multiplication of the pigment of the Ciliary region all round, with abundant scattered unpigmented cells mixed with and lying internal to them. There are large deeply staining colloidal globes on the internal surface of the basement membrane of the Choroid. The Retina is detached. The Iris is thin, adherent, and inflamed. The Long Ciliary Arteries are about normal. The condition of the Optic Disc is doubtful, on account of the Retinal detachment. The

Left eye has good vision, though it aches occasionally, and its Tension is slightly increased.

No. 363. George C., æt. 14. His *Right* eye has, from Ophthalmia Neonatorum, a prominent corneal Staphyloma whose apex is below the horizontal line. There is a slight bluish thinning of the corneal margin above. The Tension is increased. He never remembers to have had either perception of light or pain in it.

On Equatorial section the Vitreous is seen to be fluid, except a little at the lower part of the Ciliary circle. The Lens is represented by a cartilaginous-looking nodule adhering to the posterior corneal surface at its lower part. The Optic Disc is deeply cupped, though containing many nuclei. There is a small atrophic crescent to its outer side.

In the upper Ciliary region the Iris is adherent, as a web of pigment, to the upper corneal margin. The apices of the Ciliary processes are much stretched forward. There is vast increase of the pigment of the ciliary region into brownish-black irregular layers, intermixed with or internal to which are abundant loosely arranged nucleated cells. The Circulus Major is represented by an enormous thin-walled cavity, diam. .068 mm., walls .002 mm. The muscle measures .35 mm., its structure is moderately good.

The lower part of the Ciliary region is generally the same, but the muscle measures .2 mm. only. The cavities in the apex of the muscle are also considerably less large than above; diam. .045 mm., walls .002 mm. thick. Vastly inflamed patches of Iris are found occupying irregular depressions on the posterior corneal surface.

GROUP VI

(diseased eyes with normal T) includes 30 cases. The average thickness of the Ciliary Muscle is .597 mm. The diameter of the Circulus Major is .028 and its wall thickness .0079 mm. Only two cases of this Group present a very large Circulus, as in Group I. Both were examined 3 years ago and, most unfortunately, specimens were prepared from one part only of the Ciliary Circle. One case is No. 79.

Arthur B., æt. 21. His *Right* eye has the whole Cornea densely leucomatous, apparently being so since birth. He never re-

members any vision in it. Though the whole globe is enlarged, especially in an antero-posterior direction, it is so sunken that its presence could hardly be recognized by inspection during life, nor could the Tension be well determined. After excision this was registered as normal.

On examination after excision: The Iris is quite free and the Canal of Schlemm large. All round the O. D. is a large thinned staphylomatous area, involving the yellow spot. Corresponding to this the Choroid is atrophied. The Ciliary muscle is well developed, .63 mm.; the Circulus Major is large, .065 mm., and its walls thin, .003. The Vitreous is rather fluid. The left eye has a total hypermetropia of about 3 D.

This is a case whose relation to Group I and whose real nature might give rise to much discussion. The other is No. 21.

Maria C., æt. 35. She has severe corneal ulceration with hypopyon, from a blow 24 days before excision. In the Lower Ciliary region the muscle is well developed, measuring .6 mm. The Circulus is large, .087, and its walls of relative slight thickness, .0086 mm. The Iris is free and Schlemm's Canal of moderate size. The Optic Disc is swollen.

The cases standing next to these, in respect of their arterial measurements, average .034, .033, .032, .031 (two cases), and .030 mm. respectively. In all these the walls are of fair thickness. No other cases of this Group exceed .029, or have thin walls.

The case with largest diameter (.034) is that of a man, æt. 32, in whom Glaucoma followed a slight injury 15 years ago. The Globe is enlarged, the Iris periphery adherent, and the Optic Disc deeply cupped. The walls of the Circulus are very thin. It was recorded as normal at excision.

The next two cases are extremely myopic eyes, the first of which was removed on account of long-standing corneal ulceration. The fourth (No. 773) is a case of Buphthalmos with excluded pupil and vastly deep Anterior Chamber. The Tension had previously, without doubt,

been in excess, though it was recorded as normal at excision. This case has been already referred to (page 412).

The two next succeeding in size have cicatrices of old corneal ulcers, in which the Iris is entangled. Their tension was formerly in excess. In one a recent Iridectomy has reduced it to the normal. The case next in order of size to the above is one of Acute Plastic Irido-Choroiditis.

The nature of the cases just recited is interesting in relation to the Groups previously described.

The condition of Schlemm's Canal and of the Iris periphery has been already referred to under Group I.

The remaining eyes in Group VI were excised on account of various causes, such as Corneal Ulceration, Iritis, and Keratitis, specific and otherwise, &c.

GROUP VII

(with — T) has a muscle nearly as bulky, on the average, as that of healthy eyes, and exceeding that of Group VI. But in this respect measurements are somewhat faulty, as the texture of the muscle is in many cases very thin, and in several a contracting Vitreous has, by separating the fibres, increased the apparent bulk of the muscle. The cases where the muscular structure is atrophied are those which have had, as indicated by their history and by the condition of the Disc and Iris, a previously increased Tension.

The Arteries average less than in Group VI. Speaking generally, it is a fact that a smaller arterial diameter is associated with — T. But there are certain exceptions, as in the last Group. The one most marked (No. 161) has an average arterial diameter of .04 mm., with good walls (.01 mm.). The muscle is well developed and the Iris periphery free. The limb of the Iris is entangled on one side in the scar of an old Iridectomy wound. The pigment of the Ciliary region on the side opposite to the Iridectomy

is scattered and atrophied. There are elsewhere indications of chronic Irido-Cyclitis and of extensive old Choroido-Retinitis.

The next case (No. 220) has an arterial average of $\cdot 036$ mm.

It is a man, *æt.* 58, whose *Left* eye was burnt by a firework explosion 9 weeks before its excision. A great part of the Ciliary circle and Iris exhibits vast atrophy and scattering of its pigment, black granules scattered over an extended area alone remaining. The Cornea is opaque and vascular. The Canal of Schlemm is open. The Iris margin is loosely adherent and the muscle fairly developed.

Another exceptional case in respect of the artery is No. 217.

A man, *æt.* 24. His *Right* eye has been the subject of chronic Irido-Choroiditis. The T appears to have been formerly +. A large Iridectomy was done outwards 9 months ago. The base of the Iris remains, however, adherent to the Cornea here, this condition having apparently preceded the Iridectomy and not been altered by it. There is great excess of nuclei round the slightly adherent base of the Iris on the opposite side of the Ciliary Circle and in the part of the muscle adjacent to it. The Canal of Schlemm is open. The Circulus averages $\cdot 036$ mm. The Choroid is affected all over, being partially covered internally by bone.

Five more cases with — T, average more than $\cdot 026$ mm. One (No. 183) is a case with excluded and occluded pupil after Syphilitic Iritis (acquired). This case is a typical instance of the scattered granular atrophic condition of the pigment of the Ciliary body already mentioned. Another (No. 189) has long-standing Irido-Choroiditis, excluded pupil, and detached Retina. The third (No. 190) was excised 57 days after a perforating wound, which resulted in Suppurative Irido-Cyclitis. The fourth was excised 28 hours after a perforating wound of Cornea, Iris, and Lens; and the last, on account of a very thin yielding

Corneal Cicatrix, after ulceration due to Gonorrhoeal Ophthalmia.

These 2 last can scarcely be said, however, to be cases with — T, properly speaking, as the decrease is due to the increased capacity of the globe, or to the escape of fluid through the open wound. The measurements of the great majority of the remaining cases are extremely small, as will be inferred from the average of the entire group. These measurements are put in contrast with others on page 380.

The examination of the 13 cases, in which Iridectomy has been performed, is instructive.

Six of these belong to Group I, and in none of these, of course, has the operation reduced the Tension. Excision has in most taken place within a few weeks of the Iridectomy. Notwithstanding the great proportion of cases in which a dilated Circulus Major is found in this Group, yet in only one case out of these six, do dissections show the Circulus enlarged at the part of its circuit corresponding to the Iridectomy. In all the 5 it is not large, varying from .034 to .007 mm., the total average being .021 mm. In only one case is the vessel on the opposite side as small, the average of these being .048 mm. The totally exceptional case (No. 303) is recited above (page 395) as having a much-dilated Long Internal Ciliary, together with a normal-sized Circulus Arteriosus Iridis Major: thus, among the 6 Iridectomized eyes are found twice as many with the Circulus unenlarged at its upper part, the Iridectomy having been done upwards in all, as among the remaining 21 cases together.

Speculating as to the reason of this astonishing fact, I can only suggest that either the Iridectomy chances to have been done on that very eye and in that region of it in which the Circulus is small, or that the operation has reduced the size of the artery, either in part or throughout the whole of its extent. On a comparison of the figures involved, the first supposition seems extremely improbable.

In connection with the second, the cases in which - T exists in eyes formerly Glaucomatous show that a diminution in the arterial size has in all probability occurred (see page 384).

It is possible that Iridectomy cures by tearing or removing the base of the Iris near a dilated vessel, and that it fails when the T depends on other causes.

It is proper to observe that in only one case (No. 303) does the operation appear to have been well done. In three the Iris was left entangled in the scar, thus setting up great Iritis; and in the remainder the adherent and atrophied condition of the Iris base has prevented its removal by the operation. It is but just to say that very few of these operations were performed at Moorfields Hospital.

Iridectomy has been done without avail in 3 cases of Group IV. In 2 the Iris is left in the scar. The remaining one in which the pupil has formerly been excluded shows great Iritis and Cyclitis, though the Iris has been perfectly removed.

Group VII (- T) contains 4 Iridectomized cases. In one the Iris is in the scar, and in another the Iris base was and remains adherent. In one the operation was followed by plastic, and in another by suppurative Iritis.

I have tried to confine myself to facts, and have ventured to express no opinion as to the effect of this dilatation of the arteries, and their wall thickness on the pressure within them, or on the escape of fluid through their walls. It will perhaps be possible to do this more effectively when the size of the aperture through which the Anterior Ciliaries enter the globe, and the distance to which this condition extends backwards along the trunks of the various vessels are determined.

A series of experimental researches, analogous to those recently carried out by Max Knies on healthy animals, would be of immense value in determining the mode in which the condition I have described finds expression in results.

Much remains to be said as to the influence of the Nervous System on arterial calibre and on the transudation of fluid from the vessels, more especially, perhaps, in relation to the sympathetic.

On these points I shall await with interest the observations of those distinguished physiologists who are also pathologists and oculists.

I have to express my great obligations to Dr. O'Brien, of the Indian Medical Service, for his valuable aid in the examination of the last 20 cases, and in preparing the analysis of the mass of observations upon which this paper is founded.

BILATERAL DEVIATIONS OF THE EYES.

By PRIESTLEY SMITH,

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IT would be rash at the present time to make a positive statement as to the exact number of ways in which ocular movements are co-ordinated in the brain, but it may safely be asserted that the *chief* co-ordinations are of four kinds, viz. :—

1. Movement of both eyes to the right.
2. Movement of both eyes to the left.
3. Movement of both eyes downwards and inwards, narrowing of the pupils, and contraction of the ciliary muscles, producing increased convergence and accommodation.
4. Movement of both eyes upwards and outwards, producing diminished convergence, and accompanied by, though not actively producing, widening of the pupils, and relaxation of the accommodation.

Clinical observations have proved that these several forms of compound movement are produced by the action of distinct brain centres, and that disease may paralyse one or other of the four forms described, and leave the others intact.

In Vol. VIII of these reports I have recorded a case in which, with paralysis of the movement of both eyes to one side, the movement of convergence and accommodation remained perfect. (Case I.)

In Vol. IX I have recorded a case in which, with paralysis of the movement of both eyes upwards and outwards, the movement of both eyes to one side remained perfect. (Case IV.)

Allusions to these cases have been made recently by

Dr. Hughlings Jackson* and Dr. Ferriert†, which have confirmed my opinion as to their nature.

I am now able to complete the group by the record of a case which is an almost perfect counterpart to the second abovementioned (Case IV), a case in which the highly compound movement of both eyes downwards, with convergence and accommodation, was lost, while the other forms of movement were intact.

Wm. Y., æt. about 60, a very large heavy man, a publican by trade, consulted me in December, 1876, concerning his eyes. With the help of his wife he gave the following history. He had received a severe blow on the back of the head nearly a year ago. No bad consequences were noticed during the next few weeks. One night, without known cause, he became suddenly giddy, and "his sight was dim;" that night he snored very heavily, and next morning the right eyelid was down, and could not be raised by the natural effort. It was noticed on raising the lid that the eye squinted outwards, and that the pupil was very large. There was no pain or vomiting, and there was no loss of power in the limbs. The power of raising the lid and of moving the eye returned very gradually. The patient had always lived freely, and was probably of intemperate habits. He had had several attacks of gout.

At the time of my examination his eyes presented the following conditions:—

Right, emmetropia; $V. = \frac{12}{30}$; accommodation absolutely wanting, — with lens, + 10 far point, at 10", and near point at 10".

Left, emmetropia; $V. = \frac{12}{40}$; accommodation absolutely wanting, — with lens, + 10 far point at 10", and near point at 10".

Both pupils dilated, the left rather larger than the right; neither pupil contracted in the least under strong illumination; neither pupil contracted with any movement of the eyes.

The disc healthy, or nearly so; there was a large "physiological cup" in each, perhaps partly atrophic. The visual axes were

* An Address on Ophthalmology in its Relation to General Medicine. *Vide* Brit. Med. Journal, June 2, 1877.

† Gulstonian Lectures on the Localisation of Cerebral Disease. *Vide* Brit. Med. Journal, April 6, 1878.

considerably divergent. The left eye usually "fixed," the right deviated outwards, and a little upwards. The amount of the divergence and upward deviation was measured by prisms. Prisms of 16° and 14° placed with their bases towards the nose, neutralised the divergence, and brought the double images of a distant object, the one vertically over the other; an additional prism of 7° , placed with its base downwards before the right eye, brought the double images together.

The movements of each eye were tested by vertical and horizontal movement of an object before the patient, the other eye being covered; they were similar in each eye, viz., each eye moved—

Outwards, steadily, and apparently quite to the normal extent.

Inwards, steadily, and apparently quite to the normal extent.

Upwards, probably to the normal extent, but more easily upwards and outwards than upwards and downwards.

Downwards, not at all. Neither eye had the power to pass the horizontal plane in a downward direction, to the smallest extent. In fact the lowest level to which either eye could be directed was probably somewhat above the horizontal plane, when the plane of the face was vertical.

The divergence of the visual axes persisted during all movements of the eyes. The power of diminishing the divergence which is usually to be observed in cases of divergent strabismus, when the patient "fixes" a near object, was entirely absent. When the test object was made to approach the patient's face, he continued to "fix" it with the left eye, but the *inward* movement thereby involved was accompanied by an *outward* movement of the right eye. The left eye being covered the object being again made to approach the face, the right eye fixed it without difficulty, and, as in the other case, the inward movement of the fixing eye was accompanied by an outward movement of its fellow.

On January 16th, 1877, that is about five weeks after his first visit, the patient, who lived at a distance from Birmingham, came again. I repeated the examination of his eyes as to every detail, and found the conditions to be precisely the same as they were before.

As the symptoms of the case were remarkable, and, in

my experience, unique, I desired to corroborate my observation by the evidence of another witness. My colleague, Dr. Carter, kindly went with me through every step of the examination, with the result already recorded.

In October, 1877, and again in February, 1878, I repeated the examination, on each occasion with precisely the same results as before.

At different times iodide with bromide of potassium, strychnia, with phosphoric acid, and Friederichshall bitter water, were prescribed, but as regards the ocular condition no change was effected thereby.

With the view of testing the nature of the paralysis of the iris and ciliary muscle, Calabar gelatine discs were applied to each eye at one of the vists.

Twenty minutes later both pupils were much diminished in size, but no change was discovered in the condition of the accommodation; with lens + 10, the far point and the near point were both at 10", as before.

After a prolonged use of the Calabar discs, extending over some weeks, the conditions were still the same.

I last saw the patient in February of the present year, when the state of the eyes continued unchanged. His chief complaint was of difficulty in guiding himself when walking, especially in stepping up or down stairs.

Referring again to the four co-ordinations of ocular movements enumerated at the commencement of the paper, it will be seen that the movements absent in the present case correspond with the group constituting the third form of co-ordination.

Convergent movement was lost. — Each eye had free lateral movements in both directions, but only that form of lateral movements in which the internal rectus of one eye is associated with the external rectus of the other. The divergence of the visual axes may with great probability be ascribed to the unopposed action of the brain centre, whose function it is to diminish convergence, just as in certain cases of hemiplegia, bilateral deviation of the eyes

to the one side is caused by unopposed action of the healthy brain centre, whose function it is to turn the eyes in that direction.

Downward movement was lost.—This is a form of paralysis which is certainly extremely rare. I have seen no other case in which free movement inwards co-existed with absolute loss of movement downwards. If we try to explain it by a lesion of the nerves which actuates the inferior rectus, we must suppose the lesion to be limited to that branch, or to those fibres, of the third nerve, which supply this muscle. Such a limitation could rarely occur even the case of one eye, but when we find that both eyes are thus affected we are driven back to a brain centre actuating both inferior recti as the only possible seat of the lesion.

Bearing in mind the conditions observed in other forms of bilateral ocular paralysis, we might expect to find, associated with loss of movement downwards, a persistent deviation of both the eyes upwards from unopposed action of the opposing centre. The right eye was always directed to a higher point than the left, but whether the lowest point to which the left could be directed was on the plane, which is normally associated with a vertical position of the face, I could not determine. To ascertain this, it would be necessary to know the exact level at which the actions of the superior and inferior recti, with their respectively associated obliqui, are in equilibrium.

How is the upward deviation of the right eye as compared with the left to be explained? Without attempting, or wishing, to bind facts into accord with theory, I would suggest that this dissimilarity may have been due to the paralysis of the right third nerve, which, if we accept the patient's account of the onset of the attack, was one of the first symptoms.

That the paralysis of this nerve-trunk had disappeared is certain, for the eyelid was raised with ease, and the eye turned freely inwards; but the fact that the right inferior

rectus had suffered, so to speak, a double paralysis—a peripheral and a central—while the left had suffered the central only, is worth remembering in connection with the upward deviation of the right eye.

Perhaps the divergence of the visual axes should be attributed to the foregoing paralysis of the right third nerve, rather than, as suggested above, to the unopposed action of the centre for movements upwards and outwards. Perhaps both causes were concerned. But, seeing that the eye could turn freely inwards, and that no “lagging behind,”—that is no weakness in the internal rectus muscle—was discovered, it appears to me to be more reasonable to attribute the divergence to the central rather than to the peripheral cause.

The sphincters of the pupils were paralysed.—Under normal conditions the pupils contract in association with the bilateral movement of convergence. The simultaneous loss of these actions in the present case supports the view that their co-ordination depends on a structural combination in the brain. The inequality of the size of the pupils may possibly, like the upward deviation of the right eye, have been due to the paralysis of the right third nerve trunk. On this supposition, however, one would have expected to find the right pupil larger than the left, whereas the inequality was the reverse of this. It is worthy of remark that the pupils had lost, not only the action normally associated with convergence and accommodation, but also the reflex action induced by the stimulation of light. Is there a common brain centre for both these forms of action, closely related to the centre for movements of convergence, but capable of being thrown into independent reflex action, through a connection with the centres for visual perception?

Accommodation was lost.—Not much importance can be attached to the absence of accommodative power, for in a man of 60 years of age, whose habits of life would certainly tend to induce degenerative changes in advance of his

years, the range of accommodation would under any circumstances be very small. The fact that Calabar bean produced considerable contraction of the pupils but no change in the accommodation, tends to show that the ability of the lens to alter its shape was reduced to a minimum. The action of the gelatine discs is, however, too weak to give decisive evidence on this point, and at the time when the examination was made, I had not any experience of the far more powerful sulphate of eserine.

Having now recapitulated and discussed the forms of movement, which were absent in this case, I would point out in conclusion that the other forms of co-ordinated movement, viz., 1, 2, were intact.

Both eyes could move freely to the right.

Both eyes could move freely to the left.

Movement of both eyes upwards and outwards was represented by a considerable deviation outwards, *i.e.*, by divergence, and by a less certain though probable deviation upwards. In so far as it was not represented by a deviation upwards, it existed as a power of movement in that direction.

R

L

Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6



CONGENITAL DISPLACEMENT OF BOTH LENSES, OCCURRING
IN SEVERAL MEMBERS OF ONE FAMILY.

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FOR permission to publish the notes and sketches, which I made of these interesting cases, I am indebted to the kindness of Mr. Wordsworth, in whose clinique at Moorfields they presented themselves in November, 1877.

Congenital displacement of the crystalline lens is, *per se*, not an exceedingly rare occurrence, but the cases now under notice are of peculiar interest, as showing, to a remarkable degree, the transmissibility of this deformity which occurred *presumably* in 5 successive generations, comprising 10 individuals; but *certainly* in 3 successive generations comprising 7 individuals, of 6 of whom the accompanying drawings have been made.

The subjects of this defect are all well developed, and of rather above the average intelligence of hospital patients. They all complain of being "near-sighted," and some of them mention having "to set" their eyes when wishing to discern any particular object.

The 6 individuals who have been seen are Mrs. Harboot, æt. 59, her two eldest sons aged 37 and 35, two children of the eldest son and one child of the second son. The 7th person mentioned above is the third son of Mrs. H. He is now in New Zealand, but there is no doubt of his having displaced lenses, as he, his mother, and two elder brothers, are the subjects of Mr. Dixon's notes on partial displacement of the lens occurring in a mother and her 3 sons. (R.L.O.H. Reports, vol. i, part 54.) The remaining 3 individuals are Mrs. H.'s father, uncle, and grandfather, each of whom, she states, had the same defect as herself; and there is every reason to believe in the accuracy of this statement, as the family recognise perfectly among themselves those

who have this congenital defect; for on ophthalmoscopic examination it was found present only in those who were stated to have it, and not in any of the others who were said to be free from it; and although among the latter there was one of Mrs. H.'s sons who had $\frac{1}{8}$ of hypermetropic astigmatism and another with $\frac{1}{14}$ of myopia with their accompanying visual imperfections, yet neither of these were for a moment supposed to have the same congenital defect as Mrs. H. and the others mentioned.

After dilating the pupils with atropine and throwing the light from the ophthalmoscope mirror into the eyes, the appearances observed were as shown in the sketches, by reference to which it will be seen that the most general direction of displacement is inwards, either directly, or with an inclination upwards, but in the R. eye of Fig. 5 it is directly upwards; while in the R. eye of Fig. 6 it is upwards and outwards, and in the L. eye of Fig. 2 it is inwards and very slightly downwards. In all of them, except Fig. 1, where the lenses were becoming cataractous, the optic disc with its vessels, by using the mirror alone, could be seen at the same time both through and beside the crystalline lens, in the former case the image being inverted and moving in an opposite direction to the observer's head; while in the latter case it was erect and moved in the same direction, so that the two images crossed each other as the observer's head was moved laterally, showing the myopic and hypermetropic refraction respectively. The details of the optic disc with its afferent and efferent vessels are not represented in these sketches, as the appearances are admirably delineated by Mr. Streatfeild in the R.L.O.H. Reports, vol. viii, part iii.

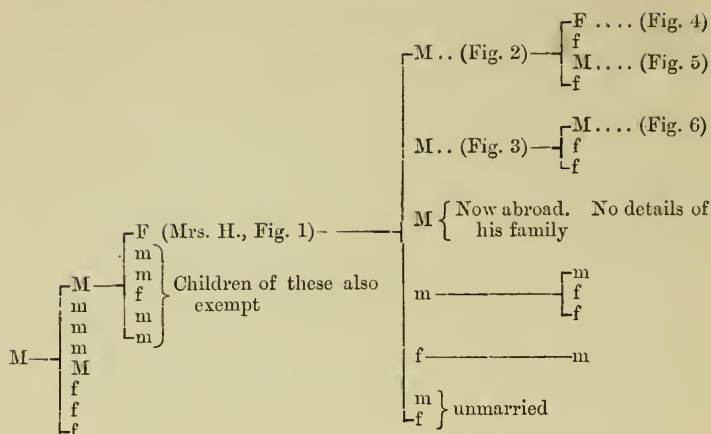
In all the cases the irides were tremulous, more especially in that part unsupported by the lens. In Figs. 1, 3, and 6, they were brown, and in the others grey or greyish-blue.

On using the oblique illumination, the lenses appeared of the normal size and shape, with a good round outline, and there was not perceived any of the "trilinear arrange-

ment of the segments" as described by Mr. Bowman in his very interesting report on a misplaced lens which he removed from a young man (R.L.O.H. Reports, vol. v, part i), but they presented a somewhat uniform milky appearance. In most of the eyes there could be distinctly traced very fine white striæ passing from the edge of the lens to behind the iris towards its ciliary attachment, running in a direction parallel to that in which the lens was displaced; they were narrow and pointed at the periphery of the lens, but spread out radially towards the iris, presenting the appearance of folds in a fine membrane, and were doubtless due to minute folds in the drawn-out suspensory ligaments of the lens.

It is instructive in all cases of transmission of deformity or disease to note the direction in which the descent occurs, whether it be chiefly through the eldest or youngest, or the males or females, of a family. In the present cases, as the following table clearly indicates, the *eldest*, whether male or female of each generation, has invariably been the subject of the hereditary defect; and further, unless the eldest happened to be a female, this latter sex has been exempt while several younger males have been attacked, so that out of 10 individuals only 2 were females.

The subjoined chart shows at a glance the 5 successive generations, commencing with Mrs. H.'s grandfather. The letters M and F stand for male and female respectively, and only those printed in capitals had the congenital displacement.



The last point of interest is the vision of these individuals which was taken in four cases, the remaining two being too young for definite information.

Mrs. H., æt. 59 (Fig. 1). V. = not $\frac{20}{200}$ and J. 1 at 8 inches. With glasses, V. = with + 4, $\frac{20}{70}$ or with - 7, $\frac{20}{50}$ and with + 30, J. 1 at 12 inches. When under atropine, V. = not $\frac{20}{200}$ and J. 8 at 10 inches. With glasses, + 4 $\frac{1}{2}$, $\frac{20}{50}$ and + 2, J. 1. Ordered + 30.

George H., æt. 37 (Fig. 2). Uses chiefly his L. eye; for this when under atropine, V. = $\frac{20}{100}$, J. 1 at 1 $\frac{1}{2}$ inches. With glasses, + 14, $\frac{20}{50}$, + 3, J. 1 at 5 inches, or with + 8, J. 8 at 14 inches; R. eye V. = not $\frac{20}{200}$, letters of J. 19. With glasses, V. = with + 20, $\frac{20}{70}$, with + 3, J. 12 for a few seconds. Without atropine, V. = L. eye, J. 2 at 3 inches by nearly closing his eye, and holding the type well to the L. side. Ordered + 8.

William H., æt. 35 (Fig. 3). Uses chiefly his R. eye. V. = R. and L., J. 1 at 2 inches by using one eye at a time, and holding the type well to corresponding side. With glasses, V. = with + 8, $\frac{20}{50}$ and J. 1 at 10 inches. R. and L., under atropine, R. eye V. = $\frac{20}{200}$, J. 1 at 2 inches. L. eye V. = not $\frac{20}{200}$, J. 1 at 2 inches. With glasses, each eye V. = with + 3 $\frac{1}{2}$, $\frac{20}{50}$, or with - 2, $\frac{20}{100}$; and with + 3 $\frac{1}{2}$, J. 1 at 8 inches for R. and at 5 $\frac{1}{2}$ inches for L. Ordered + 8.

Maude H., æt. 10 (Fig. 4). V. = $\frac{20}{200}$, J. 1 at 1 $\frac{1}{2}$ inches; with glasses, V. = with + 12, $\frac{20}{70}$, and J. 1 at 3 inches, or with - 6, $\frac{20}{200}$.

After atropine, V. = $\frac{20}{100}$, J. 1 at $1\frac{1}{2}$ inches; with glasses, V. = with + 10, $\frac{20}{100}$, with + 2, J. 1 at 4 inches. Ordered + 12.

On using the direct method of examination, the optic discs could be seen on looking at the side of the displaced crystalline lens, for which purpose, with the observer's accommodation relaxed, the strongest convex lens with which they were visible being + 5 for Mrs. H., + 10 for George, + 5 for William, and + 7 for Maude. A well-marked myopic crescent was present at the outer side of the optic discs of George and Maude. In George, William, Maude, only one eye was used at a time for either near or distant vision. In the former case the type was held close to the nose and to the side corresponding to the eye being employed, giving exactly the appearance of a very myopic person reading with one eye; the vision was probably obtained through near the centre of the crystalline lens in each case, but when convex glasses were employed, the type was held further off, and was probably seen through the periphery of the crystalline lens. For distant vision when the patient was placed at 20 feet from the types, with one eye covered, the other eye was always turned very much outwards, when a strong concave lens was placed in front of it, and *vice versa* a good deal inwards when a strong convex was substituted for the concave lens, as if in the former case vision was obtained through or near the centre of the patient's crystalline lens, and in the latter case either through the periphery or altogether beside it.

With even such defects as misplaced lenses, the individuals seem not to be much inconvenienced, for Mrs. H. with + 30 reads J. 1 and sews with ease; George H. does not require glasses for his work, as stoker, but being fond of music can see it well with his + 8; while William H. is a tool setter, an occupation requiring good sight, but with his + 8 he can do his work well and read J. 1 at 10 inches.

CATALOGUE OF THE DIAGRAMS PRESENTED TO MOOR- FIELDS HOSPITAL BY MR. HULKE, F.R.S.

I.

1. Vertical section of eyelid.
2. " " of skin of outer surface of lid.
3. Vertical section showing the capillaries.
4. Horizontal section through eyelid.
5. Conjunctival surface of eyelid, showing Meibomian glands.
6. Capillary network around a Meibomian follicle.
7. Horizontal section through lid, showing origin of Horner's muscle.
8. Horner's muscle as seen when the eyelid is everted and the conjunctiva removed.
9. Circular bundles of Horner's muscle surrounding the lachrymal punctum.
10. Lymphatics of the ocular conjunctiva.

II.

1. Retina of fishes, showing the cones. (i) perch; (ii) pike.
2. Retina of frog, cones, &c.
3. " frog, inner granules, &c.
4. Retina of salamander.
5. " "
6. " chameleon, fovea centralis.
7. Retina of chameleon near edge of fovea centralis.
8. Fovea of chameleon.
9. Chameleon, nerve fibre plexus.
- 9a. " ganglion cell and nerve fibres.
10. Rods and cones of blind worm, &c.
11. Retina of iguana.
12. " gecko.
13. " "
14. " snake.

15. Retina of turtle.
- 15a. " *Emys Europæa*.
16. " black crested sea eagle.
17. Rods and cones of vociferous sea eagle and of skylark.
18. Human retina at equator.
19. Section through human yellow spot.
20. Fovea centralis (human).
21. Cones (human).
22. Retinal capillaries.
23. Artery and capillaries of retina of monkey.
24. Fovea centralis (human).
25. Pectens and vertical sections of optic nerve, entrance of (i) chameleon; (2) iguana; (iii) gecko; (iv) alligator; (5) boa; (vi) viper.
26. Vertical sections of optic nerve, entrance of (i) horse; (ii) Formosan deer; (iii) red deer.
27. Cross section of optic nerve of Formosan deer.

III.

1. Cornea, section through it.
2. Network of cells in superficial layers of cornea of human infant.
3. Fœtal cornea (human), 5th month (in duplicate).
4. Vertical section showing anterior corneal epithelium.
5. Vertical section showing posterior corneal epithelium and adjacent cornea.
- 5a. Vertical section showing posterior corneal epithelium and adjacent cornea.
6. Corneal nerves.
- 6a. Corneal nerves of ox.
- 6b. " (vertical section).
7. Section through sclero-corneal junction (duplicate).

8. Vertical section of cornea, showing anterior elastic lamina and epithelium.
9. *Ligamentum Iridis Pectinatum*, its outer surface.

V.

- A¹. Human eye, 4th week.
- A². Rudiment of embryo, rabbit. (β) human embryo, 7th week.
- A³. Eye of chick.
1. Capsular epithelium.
2. " " from equator, development of fibres of lens.
3. Lens fibres and capsular epithelium.
4. Lens fibres of *Chelone mydas*.
5. Lens fibres.
- 5a. Bundle of lens fibres and capsular epithelium.
6. *Podargus Cuvieri*, insertion of fibres on lens, &c. *Falco*, ditto.
7. Common snakes, lens fibres.
8. Lens fibres (human).
9. " of porpoise and wild boar.
10. Human lens in fœtus, child, adult.
11. *Iguana*, section through axis of lens.
12. Accommodation; attachment of Lig. *Suspensorium Lentis*.
13. Origin of suspensory ligament of lens.
14. Intracapsular epithelium, cells of matrix undergoing transformation into cuticular fibres.
15. Wrinkled capsule of lens seen on flat.

VI. Coloured Diagrams.

1. Opaque nerve fibres at optic nerve entrance.
2. Morbid appearances in retina associated with kidney disease.
3. Morbid retina in kidney disease.
4. Hæmorrhagic neuro-retinitis.
5. Neuro-retinitis.
6. Sclero-choroiditis posterior (posterior staphyloma); 4 figures.

7. Coloboma of iris, and of choroid and optic nerve sheath.
8. Choroiditis exsudativa.
9. Detachment of retina.
10. Neuritis optica.
11. α -Retinitis pigmentosa; β -choroiditis with pigment surrounding a vein.

VII.

1. Melanotic sarcoma of choroid.
2. " "
3. Melanotic cancer of choroid.
4. Spindle cell sarcoma of choroid, with coarcted retina.
5. Spindle cell sarcoma of choroid.
6. Retinal glioma.
7. Spindle cell melanotic and medullary sarcoma.
8. Melanotic sarcoma, beginning in an atrophied eyeball.
9. Cancerous infection of the sheath of the optic nerve.
10. Medullary cancer of choroid perforating a coarcted retina.
11. Retinal glioma.
12. " "
13. " " α . Centre of retinal tumour. β . Right optic nerve near commissure. γ . Cross section of optic nerve in front of commissure.
14. Cyst of iris.
15. " epithelium lining it.

VIII.

1. Partial staphyloma of cornea, with coarctation of retina and hæmorrhage at the outer surface of choroid. (β .) Hæmorrhage from choroidal veins, detaching choroid from sclerotic, and extruding vitreous and retina through the incision for the extraction of cataract.
2. Ectasia of sclerotic and choroid, coarctation of retina, with retinal hæmorrhages. (β .) Laminated coagulum between retina and choroid.
3. Large blood-clot in a detached retina.

IX.

1. Normal pigment epithelium of retina.
2. Colloid globes on vitreous lamina of choroid.
3. Colloid thickening of vitreous lamina seen in profile.
4. Group of retinal epithelium cells overlying a vessel, and surrounded by wasted cells.
5. Ossifying fibrous mass between choroid and strongly contracted retina.
6. Ossifications at inner surface of choroid.
7. Choroidal stroma filled with exudation corpuscles from a case of sympathetic choroiditis.
8. Congested chorio-capillaris.

X.

1. Optic papilla swollen by venous congestion (Stauung's papilla), inflammatory swelling.
2. Excavated optic nerve entrances of glaucomatous eyes.
3. Inflamed optic nerve, proliferation of neuroglial corpuscles.
4. Cross section of optic nerve. Neuritis, fibrillated exudation in the loose tissue between inner and outer nerve sheaths.
5. Calcified retinal capillaries.
6. Dilated retinal capillaries.
7. Sacculated retinal capillaries.
8. Colloid globes on Membrana Limitans Interna Retinae.
9. Retina of a person who died with granular contracted kidney.
10. Retina with contracted granular kidney.
11. Vertical section through healthy optic nerve (human).
- 11a. Vertical section through healthy optic nerve (human).
- 11β. Vertical section through healthy optic nerve (human).

12. Cross section through optic nerve $\frac{1}{4}$ inch behind the eyeball.
- 12a. Shallow glaucomatous excavation of optic nerve entrance.
- 12β. Optic nerve entrance, showing (i) a very deep physiological pit; (ii) a pressure pit.
- 12γ. Transverse section of optic nerve.

XI.

1. Cicatrix of corneal ulcer (in duplicate).
2. Corneal wound with prolapse of iris (duplicate).
3. Proliferating corneal corpuscles in inflammation (duplicate).
4. Conical cornea (duplicate), sections of cones (α) at summit; (β) at base.
5. Colloid globes on the posterior elastic lamina of the cornea.
6. Cancer of cornea.
7. Epithelium from equatorial region of lens capsule of a child.
8. Fibrous web on inner surface of capsule derived from epithelium.
9. Cells of hyaloid (α) normal; (β) from opaque vitreous in anterior staphyloma.
10. Vitreous, fibrillation of its corpuscles.
11. Wrinkled capsule.
12. " " fibrous tissue on its inner surface from an old shrunken cataract.
13. Central pyramidal cataract (β) nucleated fibrous tissue on the inner surface of the capsule evolved from epithelium.

XII.

15. Diagrams illustrative of various refractive conditions.

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